

# Industry Surveys

## Computers: Hardware

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April 22, 2010

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This issue updates the one dated October 22, 2009.  
The next update of this Survey is scheduled for October 2010.

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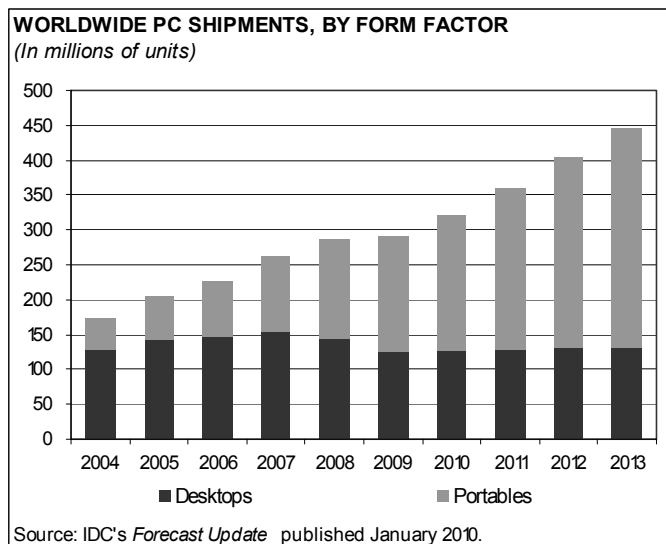
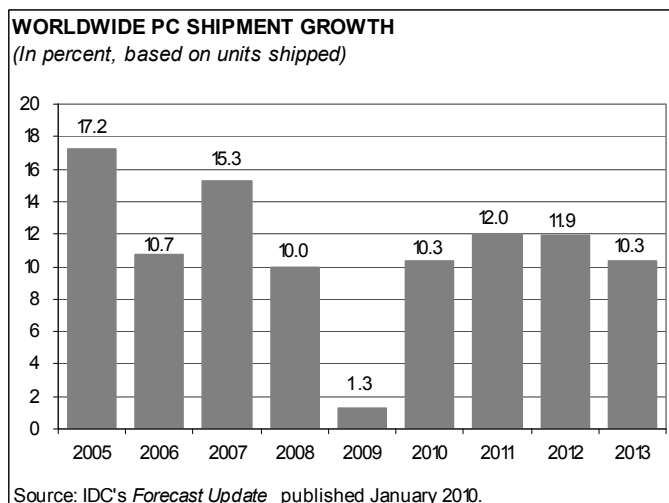
# CURRENT ENVIRONMENT

## Computer comeback underway

Computer hardware markets strengthened in late 2009 and early 2010, following a deep industry downturn a year earlier and a period of demand stabilization near cycle-trough levels in mid-2009. A burst of sales in the fourth quarter of 2009 was driven primarily by improvement in the overall economy, but was also helped by price reductions and product innovations from makers of personal computers (PCs) and servers, and by the need to satisfy pent-up demand for a technology refresh in homes and offices.

Through late March 2010, the computer industry rebound was maintaining its upward momentum. For instance, Dell Inc. and Hewlett-Packard Co. (HP) both reported what we view as strong results for quarters that included sales in January 2010. Several chipmakers echoed the theme of higher-than-expected demand in early 2010, as Texas Instruments Inc., LSI Corp., Altera Corp., and Microchip Technology Inc., among others, signaled that their mid-quarter results were running ahead of initial guidance.

The upward revisions to chipmakers' outlooks came on top of original guidance that was already tuned for a stronger-than-usual sales trend heading into the first quarter of 2010 from the fourth quarter of last year. The



first quarter usually exhibits seasonal slowness, while the fourth quarter is normally a strong quarter for sales, given holiday-driven consumer purchases and fiscal year-end buying activity at enterprises (*i.e.*, large organizations such as corporations and government agencies). Overall, we see the comeback for the computer industry that began to emerge in mid-2009 as solidly underway entering spring 2010. We expect the expansion to continue for at least a couple of years, given our outlook for further economic recovery and the persistent need to maintain effective information technology (IT) systems.

Despite a savage slump in the first half of 2009, the upswing in computer markets late in the year was sufficient to bring worldwide PC unit shipments for all of 2009 up 2.9% to almost 296 million units, according to market research firm IDC's mid-March 2010 tally. (These numbers represent a slight uptick from IDC's January data, which are shown in the accompanying charts on worldwide PC shipments.) The worldwide PC industry is the largest segment of the computer hardware industry, and Standard & Poor's is looking for PC shipments to increase about 17% in 2010, and a further 15% in 2011. This would represent a return to a rapid-growth pace seen for several years before the recent downturn: from 2002 through 2008, worldwide PC unit shipments grew at a double-digit pace every year, as tracked by market research firm IDC. Research firm Gartner Inc., as of early March

2010, was forecasting a 19.7% increase in worldwide PC unit shipments in 2010; IDC's outlook was less aggressive, as it estimated 12.6% growth. We suspect that the wide range in unit shipment projections reflects uncertainty about how robust sales will be for mini-notebook PCs: while they raise unit counts, they provide less of a revenue boost because they're relatively inexpensive. About 30 million mini-notebooks were sold in 2009, and IDC estimates some 40 million will be shipped in 2010.

We expect that the economic recovery from the global downturn of 2009 will boost information technology spending overall in 2010, but with a more visible rebound for computer hardware goods than for software and services categories, which suffered less during the downturn. Spending on IT should grow about 3.2% in 2010, according to IDC, which would bring the IT industry back to its 2008 size of about \$1.5 trillion. Along with a better year for PCs, we also expect improvement for servers, with growth in unit shipments near 7% for 2010, according to our forecast.

Emerging markets should be a faster engine for PC sales during the recovery year of 2010, given some hotspots of economic growth and some first-time adopters. According to IDC's January 2010 industry snapshot, PC unit shipments in the Asia/Pacific region (excluding Japan) are forecast to grow about 16% in 2010, faster than the 10.3% increase that the research firm projects for the worldwide PC industry as a whole. (PC unit shipments to the Asia/Pacific region rose 12.4% in 2009, 8.8% in 2008, and nearly 22% in 2007.) Similarly, for IDC's "rest of the world" (ROW) category, which includes Eastern Europe, Latin America, and the Middle East, PC unit shipments are forecast to grow 11.5% in 2010, following an abrupt decline of 9.0% in 2009, which was preceded by growth of 14.5% in 2008 and 25% in 2007. In comparison, IDC forecasts a 6.0% increase in US PC shipments in 2010, up from lackluster increases of about 2% in both 2009 and 2008. Western European demand is forecast to grow 8.5% in 2010, following meager growth near 1% in 2009 and a more robust 17% in 2008.

As usual, growth in worldwide PC unit shipments translates into a less robust tale in terms of dollar value, given lower average selling prices per unit. Price competition has been particularly lively over the past year, for several reasons: lower-cost mini-notebook PCs challenged the price level of traditional notebook PCs, and companies lowered prices in an attempt to defend their market share positions in 2009 during the economic slowdown. Additionally, Asia-based PC makers, notably Acer Inc. and Lenovo Group Ltd., are seeking to gain a bigger presence in the US market, and price is an important tool in that effort.

### **ASPs declined more than usual in '09**

IDC estimates that average system prices for desktops and portables declined by almost 14% in 2009, following more moderate decreases of 4.3% in 2008 and 1.3% in 2007, all of which continue a multiyear downtrend. Reasons for the steep decline in ASPs for 2009 include the popularization of the ultraportable (netbook or mini-notebook) subsegment and heightened competition during the recession. Mini-notebooks typically sell near \$400 apiece, compared with about \$900 for a traditional notebook PC, which weighs on the overall ASP statistics.

We think that average system prices for all PCs will decrease about 6% in 2010. Combined with our projected increase in PC unit sales of 17%, that drop in ASPs would result in an 11% increase in the worldwide dollar value of PC sales. This would represent a good year for the PC makers, and certainly a big improvement over 2009. Most companies in the PC supply chain undertook significant cost-cutting campaigns during the downturn that should help make the most out of any improvement in sales or pricing in 2010. One potential drag on profits would be higher component prices: as the hardware industry rebound gains speed and chip orders accelerate, semiconductor pricing is beginning to rise.

### **Portability a key demand driver**

We expect that underlying demand for PCs will be aided by ongoing adoption of operating system updates from Microsoft Corp. (Windows 7) and Apple Inc. (Snow Leopard); a rebound in growth in emerging economies around the world; and a continuing shift toward notebook computers, netbook computers, and wireless connectivity. Portability has been a key driver: people increasingly want their own computer and the ability to take it with them easily. PC users want to clear their desks of cords, which further drives demand for portable PCs and wireless accessories. The year 2009 was the first year in which portables accounted for more than half of worldwide PC shipments.

We think the variables that could dim or brighten PC industry growth over the next few years are largely economic growth factors, such as unemployment levels, energy prices, and the pace of patching up the financial industry. Additional factors might include a possible substitution effect, wherein the purchase of an item such as a netbook, a smartphone, an electronic book (e-reader), or a tablet PC (such as Apple's iPad) defers or eliminates the need to buy a more expensive desktop or full-size notebook PC. We believe netbooks are often an add-on purchase, or complimentary good, rather than a substitute good for a personal computer. We think 2010 will be an interesting year for the industry if tablet PCs or smartphones achieve functionality and price points sufficient to erode buying patterns for traditional PCs.

Looking out to 2011, Standard & Poor's currently projects worldwide PC unit growth of about 15%, and expect dollar value to be up about 9%, as price declines continue. The actual rate could vary significantly from our projection due to a number of factors, including consumer eagerness to replace aging equipment and operating systems, or to upgrade for better portability and wireless functionality.

## MATURE MARKETS MAY LAG OTHER REGIONS IN PC SALES

PC unit shipments in the US grew at a modest pace of 6.7% in 2009, reflecting sales of 70.0 million units, according to a March 15, 2010, IDC estimate. This is an uptick from an IDC estimate made near year-end 2009 for 2.0% growth (as shown in the table "Worldwide PC shipments forecast by region," which we have retained for consistency because it shows the relative strength of regional markets). Broadly speaking, the 2005–07 period was one of strong unit growth for the PC industry, with the Asia/Pacific (excluding Japan) and rest of world (ROW) regions leading the charge, often with growth rates over 20%. The industry's slowdown during 2008–09 hurt growth in every region. From 2010 through 2013, the pattern of the Asia/Pacific region leading growth will return, in our view, as will the pattern of Japan showing the least growth. The other regions—US, Western Europe, and the ROW—should have some good innings ahead, often surpassing 10% annual growth.

Beyond the economic growth factors driving PC sales, PC penetration levels are important. Mature markets tend to have more PCs per household or per person and, traditionally, this has implied a more saturated market with less growth potential. However, we note that—in this age when a wide variety of inexpensive computers, netbooks, tablets, e-readers, and smartphones are easily available—many people have one or more

WORLDWIDE PC SHIPMENTS FORECAST BY REGION							
	2007	2008	2009	2010	2011	2012	2013
UNITS SHIPPED (THOUS.)							
United States	64,236	65,571	66,854	70,896	77,309	83,385	86,767
Western Europe	55,853	65,331	65,897	71,510	80,277	89,824	97,548
Japan	13,590	14,246	13,365	13,390	13,322	13,444	13,389
Other Asia/Pacific	67,016	72,922	81,996	95,091	112,016	130,264	151,346
Rest of World	60,704	69,496	63,252	70,509	77,185	86,012	95,362
Total	261,401	287,566	291,364	321,395	360,109	402,930	444,413
MARKET SHARE (%)							
United States	24.6	22.8	22.9	22.1	21.5	20.7	19.5
Western Europe	21.4	22.7	22.6	22.2	22.3	22.3	21.9
Japan	5.2	5.0	4.6	4.2	3.7	3.3	3.0
Other Asia/Pacific	25.6	25.4	28.1	29.6	31.1	32.3	34.1
Rest of World	23.2	24.2	21.7	21.9	21.4	21.3	21.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
YEAR-TO-YEAR % CHANGE							
United States	7.6	2.1	2.0	6.0	9.0	7.9	4.1
Western Europe	11.9	17.0	0.9	8.5	12.3	11.9	8.6
Japan	(0.9)	4.8	(6.2)	0.2	(0.5)	0.9	(0.4)
Other Asia/Pacific	21.8	8.8	12.4	16.0	17.8	16.3	16.2
Rest of World	25.3	14.5	(9.0)	11.5	9.5	11.4	10.9
Total	15.3	10.0	1.3	10.3	12.0	11.9	10.3
Totals may not add due to rounding.							
Source: IDC's <i>Forecast Update</i> published January 2010.							

PCs, as well as several gadgets that perform some PC-like functions. Thus, the questions a pollster asks to probe for unmet demand for personal computing equipment will have to become more sophisticated.

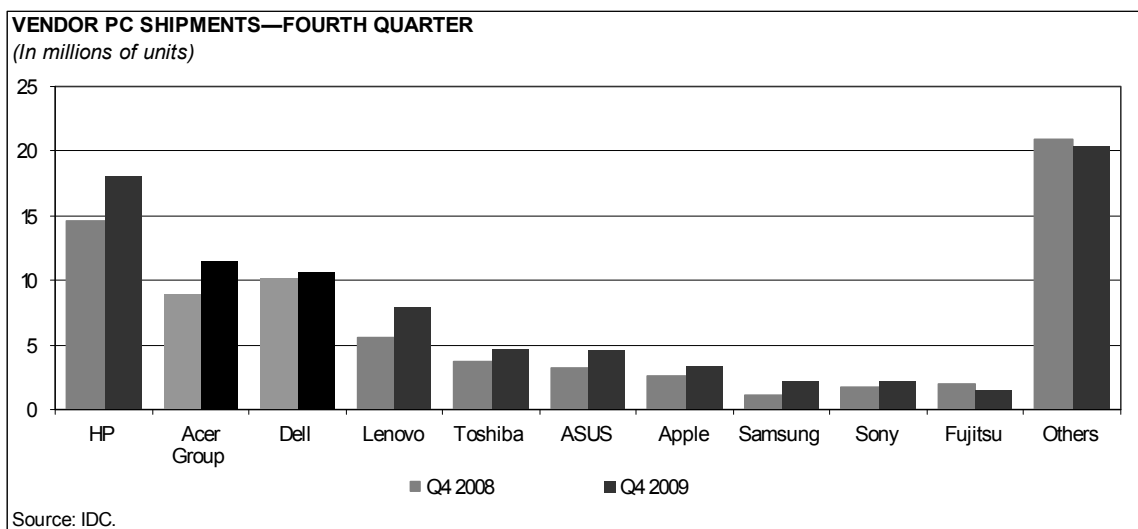
### Asia/Pacific may gain PC market share as industry rebounds

In 2009, regions outside the US accounted for over 75% of worldwide PC unit shipments. Given our outlook for more rapid growth ahead for Asia and some other markets, we expect to see this percentage increase to 80% by about 2013. Correspondingly, the US share would dwindle toward 20% by 2013. In 2009, by IDC's estimates, the Asia/Pacific region (excluding Japan) represented about 28% of global PC shipments; it might grow to a 30% share in 2010 and, looking further out, a 34% share in 2013. In our view, such an increase would reflect relatively rapid economic growth in China and its neighboring countries, and rising penetration of PCs in the Asian regional markets.

Regions that might maintain their present market share while Asia grows include Western Europe, with almost 23% share in 2009 and 22% estimated for 2013, by IDC figures, and the rest of world (ROW), with about 22% share estimated for both 2009 and 2013. Japan's share may slip from about 5% in 2009 to roughly 3%. All of this data points to a big turnabout from 2004, when the US was the biggest region with about 31% PC unit market share and Asia/Pacific had 21%.

### PC market share: Acer catching up with Dell

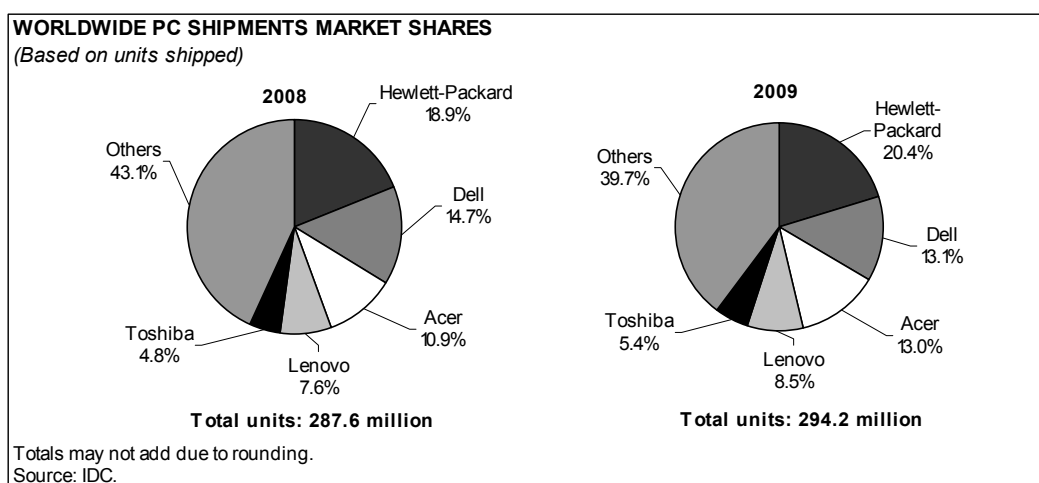
Comparing the market-share stories for the fourth quarter of 2009 and the prior-year period, most of the incumbent top-10 PC vendors managed to increase their market share, with the exception of Dell and Fujitsu. Thus, the recurring theme of the "big get bigger" rang true again in 2009. One reason may be the clout that comes with economies of scale. Another reason may be that in a time of exceptionally strong pressure on prices, customers gravitated toward brand names instead of white box PCs: Why not get the PC with the big reputation if it doesn't cost much more? Certainly many of the big names in PCs took advantage of the mini-notebook phenomenon. The largest vendors of mini-notebooks in the fourth quarter of 2009, as ranked in order of size by IDC, were Acer Inc. (with about 25% of the mini-notebook market), ASUSTek Computer Inc., Hewlett-Packard Co. (HP), Dell, and Samsung Electronics Co. Ltd.



A buzzworthy note in the market share picture is Acer surpassing Dell in PC unit sales in the fourth quarter of 2009. Hewlett-Packard remained the top player in Q4-2009 with 20.8% share of worldwide PC sales, up from a 19.6% share in Q4-2008. Acer improved to second place in Q4-2009, with a market share of 13.2%, up from 12.0% in the year earlier period. Meanwhile, Dell slipped to No. 3 as its market share decreased to 12.3% from 13.6%. We think Acer's ascent owes a lot to its emphasis on mini-notebooks, which are low-priced items that can generate high unit sales more easily than full-size notebooks can. Dell's range of PC products is broader than Acer's, and includes mini-notebooks, traditional laptops, and some pricier specialty laptops featuring ultra-thin profiles or high-performance features. In addition, Dell has been

shifting to new distribution strategies that seemingly exposed it to some weak market niches in the downturn. Lenovo was No. 4 with a market share of 9.0% in Q4-2009, improved from 7.4% in Q4-2008. Toshiba was No. 5 with 5.5% share in Q4-2009.

Looking at the market share pies for the full-year 2009, we see industry leader Hewlett-Packard improving to a market share of 20.4%, from 18.9% in 2008. For all of 2009, Dell narrowly maintained the No. 2 spot, with a 13.1% market share, down from 14.7% in 2008. Acer was No. 3 with a market share of 13.0%, up from 10.9% in 2008. Lenovo maintained its No. 4 position, with a market share of 8.5%, marking an improvement from 7.6% in 2008. Toshiba was No. 5 with 5.4% market share, up from 4.8%.



Together, the top five (Hewlett-Packard Co., Dell Inc., Acer Inc., Lenovo, and Toshiba Corp.; these are all the same names in the same order as a year ago on a full-year basis) held global PC unit market share of 60% for full-year 2009. This is higher than the 57% top-five concentration a year earlier, suggesting a continuation of the long-term trend toward an industry where the big players are getting bigger. Another way to gauge the consolidation is to look at the shrinkage of market share for the “Other” category (vendors not in the top five) to just under 40% of the global PC market in 2009, down from 43% in 2008.

Looking ahead, we think the top-tier PC makers continue to have an opportunity to outpace the industry as a whole, at the expense of white box vendors. We believe this is due mainly to the advantages of economies of scale: more bargaining power with component suppliers, better global marketing and distribution networks, bigger research and development budgets, a greater ability to shift production costs and tax liabilities to the most advantageous countries, and more consistency in attracting top managerial talent, among others. Following are some comments on the performance of top PC vendors in 2009 and early 2010.

◆ **Hewlett-Packard.** HP remains clearly in the lead in terms of global PC volume, with 20.8% worldwide market share in PC unit shipments as of the fourth quarter of 2009, according to IDC data. HP improved its market share in 2009, and managed to be the third largest vendor of mini-notebooks in the fourth quarter of 2009, besting its large-tier rival Dell and almost matching mini-notebook sales for small-tier, player ASUS, which focuses on smaller portable products. HP typically sells about two-thirds of its PCs outside the US, so if overseas PC markets growth is stronger, as we expect for the next few years, HP should have an edge over Dell’s more US-centric sales pattern. Of course, Dell is shifting strategies and may take fuller advantage of overseas opportunities in the future.

We view HP as following through well on strategies led by new management that arrived in mid-2005. One strategy is cost savings, with an eye toward saving in every phase of global operations, and we suspect this persistent review of operations has also fostered production efficiencies and better product development. Another strategy is broadening the product mix to include more services and hardware that can help to offer more complete IT solutions to data center customers. Management took on the project of acquiring Electronic Data Systems, a large IT services provider, in August 2008. On September 23, 2009, the

company announced that it was rebranding “EDS, an HP company” to “HP Enterprise Services,” which we take as a sign of a completed integration. Now HP has moved on to other acquisitions to round out its capabilities, notably the acquisition of 3Com Corp. announced on November 11, 2009, in an approximately \$2.7 billion pending deal that would enhance the company’s enterprise networking solutions. We think the diversification further into IT services helped to buoy revenue and earnings for HP through a downturn that was harsher on hardware than on software or services.

In the US, HP overtook Dell as the top vendor of PCs by unit shipments, with a market share of 26.9% for full-year 2009, compared with Dell’s 24.5% share. Together, the pair had about 51.4% market share for US PC unit shipments in 2009, with closest rival Acer at 11.4%.

◆ **Dell.** In the fourth quarter of 2009, Dell’s global PC unit shipments grew 5.2% from the year-earlier period, underperforming the industry’s average pace of 15.2%. We think this performance could trend better if Dell can achieve better sell-through of its mini-notebooks, which could quickly boost unit sales numbers, and if corporate markets rebound strongly in the second half of 2010 with improvements in the economy. Dell’s worldwide market share dropped to 12.4% in Q4-2009 from 13.6% in Q4-2008. In the US market, where Dell typically sells almost half its PC units, the company earned a market share of about 22.4% in Q4-2009, slipping from a market share of 26.3% in Q4-2008. This put Dell clearly behind HP’s 29.2% share of the US market by a wide margin of 680 basis points. This is a turnabout from Q4-2008, when Dell maintained a slim lead over HP in US market share.

Dell took a big strategic step toward growth in IT services on September 21, 2009, when it announced an agreement to acquire Perot Systems Corp. for approximately \$3.9 billion in cash. The deal was completed on November 3, 2009. The combination creates within Dell an enterprise-hardware and IT services operation with about \$16 billion in annual revenue, of which about \$8 billion is from enhanced services and support. By comparison, Dell reported total revenue of \$52.9 billion for fiscal 2010 (ended January 2010). Perot Systems had only about \$2.8 billion in revenue in 2008. Thus, the \$8 billion services operation represents roughly 14% or 15% of annual revenues for Dell. While we believe this is beneficial to Dell, it is only a small step toward closing the gap with HP, for which services revenue represent about 32% of total segment revenue, or with IBM, for which services revenue represented almost 60% of revenue. Dell views the Perot Systems operations as a potential anchor acquisition, to which bolt-on acquisitions might be made, so perhaps Dell will have more to say about its growth direction in the future.

Strategically, Dell looks like it is finally beginning to follow the balanced IT conglomerate model exemplified by IBM over the past five years, in which hardware, software and services are all pursued in an effort to offer total IT solutions, rather than stand-alone products and services. The conglomerate model has appeal as a way to create a less cyclical, more effective and diversified IT systems company. Looking at a comparison table of five IT heavyweights active in the data center markets, Dell’s profile would show a lot of hardware, some services, and would be light in software. Dell is also relatively light on R&D expenditures. As a result, we think Dell has a way to go if it seeks to follow a more rounded conglomerate model.

Meanwhile, on the PC front, Dell is striving to improve its distribution via a network of retail partners in order to boost sales and thus permit greater economies of scale. We believe Dell is succeeding in lifting its volumes, but we still observe fluctuations in various margin and expense levels from quarter to quarter that suggest to us that Dell has not yet fully arrived at its new operating model. Therefore, we think Dell’s strategic transition is still in progress.

Beyond PCs, news reports in March 2010 described Dell as readying its first smartphone product, dubbed the “Aero,” for the US market. The phone is based on Dell’s Mini 3 phone being sold in China and Brazil. While smartphones are an increasingly crowded market, we think Dell’s marketing experience may give it a chance.

◆ **Acer and Lenovo.** Taiwan-based Acer moved up to second place on the worldwide PC market share list for Q4-2009, with a unit shipment share of 13.4%, up from 12.0% a year earlier, according to IDC. Acer has been leading the charge in netbooks and is doing well in consumer markets in the US and globally. It remains to be seen if Acer can eventually do as well in the corporate market, which requires different marketing and support strategies. Close rival Lenovo held on to fourth place in the global list. Lenovo



improved its market share to 9.2% from 7.5%, for a 170 basis point gain that was a bit more than Acer's gain of 140 basis points.

In the US market, Acer remained No. 3 by a wide margin in Q4-2009, although it actually lost market share with an 11.9% share compared with about 12.4% in Q4-2008. Toshiba moved up to fourth place with 8.3% of US market share in Q4-2009, up from 6.0% a year earlier. Apple slipped to fifth in the US market as of Q4-2009, despite improving its market share to 7.4% from 7.0%. The top five vendors in the US market accounted for about 79.2% of the US market in Q4-2009, compared with 76.7% in Q4-2008, showing that the big players are getting bigger while the others are getting squeezed.

◆ **Apple.** California-based Apple remains somewhat small among global PC vendors, at the No. 7 spot on the list of vendors by worldwide PC unit sales, with a market share of 3.8% in Q4-2009, up from 3.4% a year earlier. Unit sales of the company's Macintosh (Mac) line of computers have been faster than the industry pace in the past several years. Indeed, the company grew unit sales at a 32.0% pace in Q4-2009 versus Q4-2008, almost double the industry pace of 16.9%. We think product differentiation by means of innovative design and elegant styling has helped, as has the distinctive retail experience available at the Apple stores. While other PC makers rely heavily on mass-market retailers, Apple's store count has grown to 273 stores as of its September 2009 fiscal year end, up from 247 in September 2008 and 116 in 2005. Apple's computer sales are aided by the popularity of somewhat complementary Apple's iPod and iTunes music offerings, and that runaway hit product, the iPhone.

Apple planned to start sales of its new iPad brand tablet computer in April 2010. The iPad aims for success somewhere in the middle of the form-factor continuum between notebook computers and smartphones. A main advantage that the iPad will have over rival entrants will be the large number of software applications already available. Hewlett-Packard plans a tablet computer platform, known as Slate, to launch sometime in 2010. The quest to discover what kinds of hand-held devices capture consumers' attention and gadget budget could be a big story in 2010. The tablet challenge might be viewed as the latest round of efforts to make the Internet widely available in a personal and portable way.

Apple has a bigger presence in the US PC market than in the global market. For full-year 2009, Apple's US market share edged up to 8.0%, from 7.9% for 2008. Apple remained the fourth largest vendor in the US in 2009 by unit sales. The company's ability to outgrow the industry in terms of PC units is all the more remarkable because it has relatively high average selling prices.

## SERVER MARKET POINTS TOWARD RECOVERY IN 2010

During the fourth quarter of 2009, worldwide server market revenue decreased 3.9% from Q4-2008, and eased to a level near \$13.0 billion, compared with \$13.5 billion a year earlier, according to IDC data, representing a slower rate of decline than in recent quarters. Worldwide server units actually increased 1.9% to about 1.9 million in Q4-2009. We view the server market as stabilizing through year-end 2009, and project a return to growth near 7% for 2010, as IT spending picks up with the economy and new server products are introduced.

The three segments of the server market seem to be coming back at different rates. The high-end server segment, which suffered the most over the course of the downturn, experienced a 23.6% decrease in worldwide factory revenue in Q4-2009 versus the prior-year period, reflecting slack demand and customers waiting for a round of product releases in 2010. The mid-range server segment (those priced in the \$25,000 to \$250,000 range, as tracked by IDC) saw a milder decline of 5.3% in Q4-2009 against Q4-2008. The volume server market showed revenue growth of 9.9% in Q4-2009, suggesting that lower-priced servers are leading the way to industry recovery.

Demand drivers include a need for a wide range of server systems to handle customers' computing tasks, as well as by customer interest in IBM System x products, and blade products from IBM, HP, and Dell. Although enterprise customers are favoring volume servers, price competition tends to hinder revenue advances in this segment. With sales depressed for more than a year, the need to update an aging installed base of servers is building; this should help to spur sales when economic conditions permit, which could be

in 2010. A major wave of new product adoption, whenever it finally occurs, could shake up market share positions.

The need for improved system performance continues to drive demand for servers, with customers also looking to keep complexity and cost at manageable levels. Another factor in industry growth is server “virtualization,” in which a software application splits a server into multiple operating environments for greater capacity and efficiency. We think that a trend toward virtualization may somewhat temper demand for new server systems.

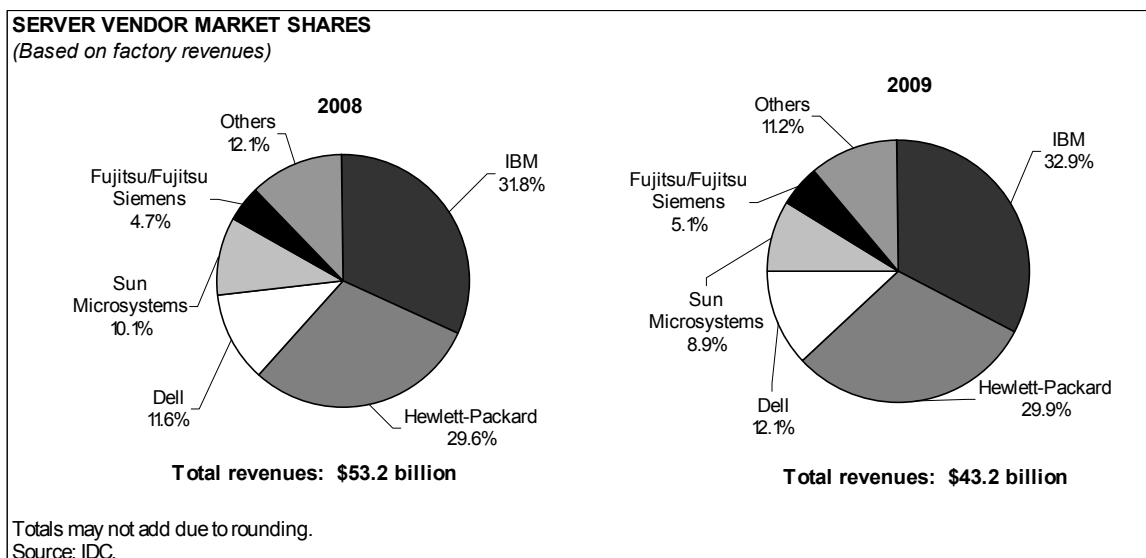
For full-year 2009, worldwide server revenue decreased 18.9% to \$43.2 billion. Unit shipments decreased at a similar pace of 18.6% to hit 6.6 million units in 2009, down from 8.1 million units in 2008, which stands as the historic peak for the server industry. The industry downturn affected all regions and types of servers, but the lower-priced volume servers (and blade servers in particular) appear to be leading the comeback because they can offer opportunities to save money on power consumption and space, as well as lending some dynamism to data center design.

Blade servers continue to be a relatively strong niche segment in the server arena, as they address common problems of energy consumption and space limitations. In the fourth quarter of 2009, blade servers represented 13.9% of quarterly server revenue, up from about 10.4% of total server revenue in the fourth quarter of 2008. Hewlett-Packard and IBM are the largest blade server vendors, with market shares of 52.4% and 28.4%, respectively.

Before the big downturn in 2009, the server industry rose at about a 2% pace for several years. We expect a rebound to pre-downturn levels over the next few years, before a return to a long-term trend of slow growth. The speed of the projected rebound would vary with the global economy and amount of pent-up demand that may exist for modern data center equipment.

#### Server market share for 2009: Sun shaded by slow acquisition

Top player IBM remained the biggest overall server vendor in full-year 2009, with a market share of 32.9%, up from 31.8% in 2008, as tracked by market researcher IDC. No. 2 HP improved its share slightly, to 29.9% from 29.6%. No. 3 Dell gained share to 12.1% from 11.6% a year earlier. No. 4 Sun Microsystems saw its market share drop to 8.9% from 10.1% in 2008, as its revenue drop of 28.8% was much worse than the 18.9% decrease for the server industry. In our view, Sun became vulnerable to customer loss as its acquisition by Oracle was prolonged (it took about nine months to close) because of scrutiny by European antitrust regulators. Sun’s competitors thus had ample opportunity to pitch their roadmaps for product development, while Sun’s managers were in a transition status somewhat akin to that of lame duck politicians. Even No. 5



Fujitsu gained market share, to 5.1% from 4.7%. All of the top five vendors saw significant revenue deterioration; Fujitsu suffered the least deterioration with a 12.8% decline in revenue. The top five server makers, with the exception of Sun, all showed less revenue loss than the industry as a whole in 2009.

◆ **IBM.** In 2009, IBM held its leading spot among global server vendors, controlling about one-third of overall industry sales. For the fourth quarter of 2009, the company held a 35.4% share, indicating that its growth push had some momentum toward the end of 2009. In early March 2010, IBM announced its new eX5 systems for bladed and rack-optimized x86 servers. This new generation of servers features a separation of memory and the central processor, allowing the ability to add more memory rather than having to buy a new server. This “on-demand memory” feature should create some product differentiation for IBM in a competitive marketplace.

◆ **Hewlett-Packard.** Having held its own in the server markets in 2009, HP maintained its No. 2 spot in overall market share and suffered slightly less revenue loss than the industry. In the hot blade server segment, HP remains the market share leader, with about half of the blade market (IBM is an improving No. 2. with about a quarter of the market). HP is seeking to serve more parts of the data center market, as evidenced by its plans to acquire 3Com Corp., a networking solutions provider, in pending deal valued at approximately \$2.7 billion. While this transaction remains subject to customary closing conditions, we expect it will close in the first half of 2010.

◆ **Dell.** Dell added market share to hit 12.1% in 2009, up from 11.6%. It remains a tough competitor in blade servers. We believe that as its PC operations face skinnier margins, Dell may become more aggressive in wider-margin opportunities in servers and related service markets in years ahead.

◆ **Sun.** In 2009, Sun’s last year as a stand-alone company, its server revenue withered almost 29%, versus 19% for the server industry as a whole. The company spent most of the year waiting to be acquired by Oracle, which gave competitors’ sales forces ample time to try to persuade Sun customers to switch vendors. Sun was a venerable Silicon Valley name. It boasted annual revenues topping \$18 billion back in fiscal 2001 (ended June 2001), only to see that total plummet to \$11.4 billion in fiscal 2003. Revenues had mended a bit to \$13.9 billion by fiscal 2008, only to slip back to \$11.5 billion in fiscal 2009. With the completion of Oracle’s acquisition of Sun in late January 2010, it now remains to be seen how well Oracle will do in revitalizing Sun’s business. Some pluses we see for the Oracle/Sun operations are a large marketing team, an ability to finance a lot of research and development, and an opportunity to leverage Sun’s hardware and software technology with existing Oracle products—and, perhaps more importantly, with future generations of products.

## ENTERING AN ERA OF IT CONGLOMERATES

Through one prism, the strategic direction of the larger computer hardware makers is away from being merely the makers of best-of-breed computing machines, and toward becoming a pack of information technology conglomerates, each offering a viable balance of hardware, software, and services that permit them to satisfy a broad range of big customers’ data center needs. In this way, the hardware products that are often the historical center of a company’s operations—but which have been increasingly subject to competition, commoditization, and thinner margins—became a helpful platform to sell higher-margin software and services that complete the suite of products that enterprise customers need. We view IBM as an often emulated example of the IT conglomerate model. For a decade, the company has been systematically divesting itself of non-core hardware lines (including PCs, printers and disk drives), while acquiring and building out software and services that are complementary to its higher-end hardware products.

With the entry of software heavyweight Oracle into the hardware fray via its acquisition of Sun Microsystems in January 2010, and with networking heavyweight Cisco now with one year’s experience with its Unified Computing initiative, we thought it would be interesting to look at a 2009 snapshot of the industry. Using recently published annual company data for the four largest server makers, plus Cisco, we display segment revenues using a hardware/software/services breakout. We have added historical Oracle and Sun numbers together, with the caveat that their integrated numbers a year from now are apt to be more

telling than this hypothetical historical glimpse. (Company details are in the accompanying table “Revenue segment profiles of selected information technology companies.”)

**REVENUE SEGMENT PROFILES OF SELECTED INFORMATION TECHNOLOGY COMPANIES**

(In billions of dollars)

	IBM	HEWLETT- PACKARD	DELL	ORACLE/ SUN	CISCO
Fiscal year	DEC. '09	OCT. '09	JAN. '10	‡ JUL. '09	
Services (including finance)	61.4	37.4	9.2	9.1	7.0
Software	24.1	3.6	0.0	18.9	0.0
Hardware	17.1	75.4	43.7	6.7	29.1
TOTAL SEGMENT REVENUE	102.5	116.4	52.9	34.7	36.1
Elimination of intersegment sales	7.6	1.8	0.0	0.0	0.0
TOTAL EXTERNAL REVENUE	94.9	114.6	52.9	34.7	36.1
R&D expense	5.8	2.8	0.6	4.4	5.2

‡Oracle fiscal year ended May 2009; Sun Microsystems fiscal year ended June 2009.

Source: Company reports.

One thing to note is the sheer size of total revenue. We think that in a conglomerate model driven by economies of scale, volume helps—and IBM and HP have it. These two have annual revenues in excess of \$100 billion. Dell is weighing in at about half the revenue level of the two leaders. Oracle/Sun and Cisco are trailing at about one-third the size of the leaders. We note that if size matters, then acquisitions should continue, probably by all five of these contenders. Acquisitions would

tend to prevent small-fry contenders that might be working on a best-of-breed product from growing up to independently challenge the big incumbents.

Another thing to notice is the balance of segments. The IBM revenue pie is perhaps the best balanced. Indeed, it is becoming a bit lopsided in favor of services, which can be a wide-margin business with reasonably predictable revenue streams based on long-term contracts, unlike the more cyclical hardware business. It may be that IBM is already at a mature stage of evolution in terms of segment balance.

A glance at HP shows a significant share for services, the second largest by far in this pack of five, though hardware is still bigger. Perhaps hardware’s relatively large share means a lower-margin future for HP; alternatively, it could mean more opportunities for bases on which to build service empires. Dell and Cisco, like HP, are heavy on hardware and have some presence in services, but have very little software. The combined Oracle/Sun operations appear to have some balance among the three revenue segments and a strong suit in software.

We examined recent R&D budgets as a line of data beyond the revenue pie that might provide a clue as to whether these companies might readily build (instead of acquire) the expertise and operations that they lack. It seems that IBM has been minding its business well in this regard, with R&D expense trending near \$6 billion a year. Following this line of reasoning, Oracle/Sun and Cisco also would seem to be capable of self-improvement over time, given R&D budgets above \$4 billion a year. Dell appears to be the odd man out here, with R&D spending recently under the \$1 billion level. Can Dell successfully differentiate its products with a relatively small R&D budget? Perhaps it can. After all, Hewlett-Packard leads by market share in one subcategory of servers—blades—despite having an R&D budget half that of IBM’s. Thus, it seems that R&D focus, combined with an effective ability to bring products and services to market, may sometimes be more important than the sheer size of R&D.

Also affecting the evolution of an era of IT conglomerates would be some corporate contenders not included in our table. Microsoft Corp. is, of course, big in software and R&D. Apple has ample cash on hand to consider acquisitions. EMC Corp. is big in data storage, as are the top four server makers. And then there are the start-ups and midcaps that somehow, despite all the competition, might upset the apple cart by delivering best-of-breed products that undercut the incumbents’ positions. ■

# INDUSTRY PROFILE

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## Volume expansion pauses for recession, while pricing pressure persists

During each evolutionary phase of the computer hardware industry, the price for computing power has decreased, usability has improved, and the market has broadened. Business spending largely drove growth in computer hardware sales throughout the 1990s. The consumer market became increasingly important during the latter half of that decade, as the Internet boom contributed to rising consumer demand for personal computers (PCs), and that trend has continued. Since 2000, increasing use of computers for audio-visual media is contributing to hardware demand.

Looking back to the 1970s, during the early stages of the industry's evolution, businesses used computers to automate back-office operations such as accounting. Continued advances in technology led to increased computing power, while the size of computers decreased. By the 1980s, computers were small enough to sit on a desktop, and the PC was introduced. Although largely a productivity tool for front-office tasks such as word processing, the new devices also spurred consumer demand for computers.

Network computing, the most recent stage in the computer hardware industry's evolution, presented a strategic inflection point in the proliferation of PCs and servers. Initially, networked computers attracted a growing base of corporate users. The emergence of the Internet gave this market another shot in the arm, and also added an unprecedented number of consumers to the mix.

Cloud computing—in which users buy processing power as a service via the Internet, rather than having to buy and maintain hardware—is an emerging part of the business. The cloud approach to delivering computing has the potential to offer users a lower-cost alternative, and to create a breed of data centers that would cater to cloud users.

Rapid proliferation of the Internet culminated in strong growth for the computer hardware industry in 1999 and most of 2000. However, the industry's fortunes reversed in 2001, and demand remained soft in 2002, reflecting the global economic downturn. From 2003 through about mid-September 2008, the market staged an expansion. Then a global economic downturn knocked IT spending down about 4.5% for 2009, with hardware suffering more than software or services. From the vantage point of early spring 2010, we think this should prove to be a year when the computer hardware industry rebound begins, followed by several years of relatively healthy growth. Standard & Poor's believes this forecast is achievable, though we expect the pace of growth to vary by segment and region.

The computer hardware industry can be divided into two main segments: PCs (including notebooks) and servers (ranging up to large-scale systems such as mainframes and supercomputers), with workstations as a third minor category. Based on preliminary estimates from IDC, the value of worldwide PC shipments in 2009 was about \$213 billion, and servers were worth about \$43 billion, for a total of roughly \$256 billion in computer hardware sales in 2009. This indicates that computer hardware is a substantial portion (approximately a fifth) of about \$1.43 billion spent worldwide on IT in 2009, which includes spending on software and services, and some near-cousins of the traditional computing industry (data storage machines, printers, ATMs and retail kiosks, and other increasingly sophisticated office electronics).

## PC SEGMENT IS LARGEST, MOST COMPETITIVE

The highly competitive PC market is the largest sector of the computer hardware industry in terms of both units and dollars. It represented over 80% of the total amount spent on PCs, servers, and workstations in 2009. As estimated by IDC in mid-March 2010, the number of PC units shipped worldwide in 2009 totaled nearly 296 million and were worth approximately \$215 billion. Unit shipments rose about 2.9%, indicating a growth year for the PC industry despite a sharp downturn that began in late 2008 and started to turn around in the second half of 2009. Although dodging an actual loss in unit shipment terms, 2009 is apt to

be remembered as a landmark bearish year for the industry, stemming from the severe economic downturn. The year 2010 should be widely welcomed as a return to more solid growth.

The PC's heyday was in the early 1990s. Between 1991 and 1995, growth in worldwide PC shipments averaged more than 20% annually, driven largely by the machines' increasing affordability and capabilities. After a 26% surge in 1995, however, growth trended downward to about 13% by 1998, and the industry was widely deemed to be maturing.

In 1999, when shipments surged 23% worldwide, PC makers enjoyed a flashback to the heady growth days of the mid-1990s. However, the unit growth rate slowed to 15% in 2000. While consumers continued to buy PCs, corporate demand started to ebb. The trends that fueled growth in 1999 were also catalysts for much of the healthy growth seen in the first nine months of 2000. Most important were continued price and performance improvements of PCs, which enabled a larger addressable market and sustained demand for upgrades, Internet-driven demand, and greater PC penetration in consumer and emerging international markets. Limiting factors included a weaker European market and a slowing US economy, which depressed growth considerably toward the end of 2000. In 2001, PC unit sales fell on an annual basis for the first time since 1985, declining 4.1%, according to IDC.

After a year of modest 1.5% unit growth in 2002, the market gained momentum in 2003 and rose 12%, led by strength in consumer demand and the replacement of desktop computers with notebooks. These factors remained key drivers in PC unit growth in subsequent years—near 15% in 2004, 17% in 2005, 11% in 2006, 15% in 2007, 10% in 2008—though growth slowed to just 3% in 2009.

Standard & Poor's projects PC unit shipments will increase about 17% in 2010, in light of continued user demand for laptops and mobile Internet access, and interest in new operating systems from Microsoft Corp. and Apple. We believe the rapidity of the industry recovery will depend mainly on the strength of the global economy.

### **PC prices in long-term downtrend**

Cheaper PC prices have been a key contributor to expanding the addressable market for the devices. According to estimates from IDC, the average system price (ASP) for PCs fell 9.5% to \$1,699 in 1999, and another 6.1% in 2000 to \$1,596. The average system price declined 11.0% in both 2001 and 2002, and another 9.0% to \$1,165 in 2003. Price declines were less pronounced in 2004, with the ASP down 4.2%.

In 2005, however, price declines accelerated again to 5.9%, and continued at a 5.4% pace in 2006, before easing somewhat to a 1.3% decline for 2007, when the average system price for PCs was \$887, according to IDC estimates. Estimates for 2008 showed an ASP decline of 4.3% to \$849. In this context, the downshift in 2009 was notable. Driven by the competitive dynamics in the marketplace, the greater presence of netbooks, and the lackluster global economy, the average system price declined almost 14% to \$731. Standard & Poor's expects the pace of ASP drops to return to a more typical pace near 6% for 2010, as the economy picks up and slowing growth in netbook sales curtails the unusual ASP pressure seen in 2009.

To some extent, price declines may reflect the pass-through of savings from cost-cutting efforts. Given the long-term downtrend in PC pricing, major players likely will remain under pressure to squeeze costs out of their businesses, in our opinion.

### **PC market share trends**

With consistent pricing pressure in the industry, the PC market has witnessed rising market share concentration among the top vendors. Only the fittest PC producers have survived. In 1992, the top 10 worldwide vendors accounted for roughly half of the market. From 1999 through 2002, however, just the top five vendors commanded nearly half (45%) of the market. That level climbed further in 2006, 2007, 2008, and 2009, when the top five held 50%, 53%, 57%, and 60%, respectively, based on IDC data.

Many industry forecasters have long predicted that the top five vendors may hold 70% of the global PC market in the future. This theory got a boost in September 2001, when HP announced plans to acquire Compaq. The deal closed in May 2002, marrying the No. 2 (Compaq) and No. 3 (HP) PC vendors. This

combination enabled the two companies to leverage the scale of the merged entity, in an effort to create an improved cost structure and greater distribution opportunities.

In terms of unit volume, Compaq was the leading worldwide PC vendor from 1994 through 2000. Dell Inc. claimed the top spot in 2001, according to IDC. In the fourth quarter of 2002, the combined HP and Compaq just barely edged out Dell, and temporarily held the No. 1 position again.

In 2003, Dell emerged as the market leader again with a 16.7% share of the market, compared with 16.2% for HP. This gap widened even further in 2004. Dell's market share grew to 17.9%, while HP's share slipped to 15.8%. Driving this trend, in our opinion, were HP's publicly stated intentions to focus on profits over PC market share. In 2005, HP's share position seemed to have stabilized at 15.7%, and the gap between it and Dell widened again, by a further 50 basis points. (Dell's global PC share for the year was 18.2%, according to IDC.)

However, this trend reversed in 2006, reflecting what we believe to be continued momentum at HP and missteps at Dell. As a result, the companies ended 2006 in a virtual tie, with each possessing about 16.5% of the market. In 2007, HP's share rose sharply to 18.8%, while Dell's share dipped to 14.9%. Thus, HP was the clear market share leader by units for 2007, with Dell a strong second; no other vendor had more than a 10% share. In 2008, HP remained the clear leader with a 19.2% market share of the global PC market by units, with Dell a strong second at 15.0%, and Acer closer in third place at 11.0%.

As discussed in the "Current Environment" section of this *Survey*, HP in 2009 widened its PC market share lead to 20.3% of worldwide unit shipments, versus Dell's 13.1%. Acer was close on Dell's heels, with a 13.0% share, and actually surpassed Dell in Q4-2009 unit sales. No. 4 in 2009 was Lenovo Group Ltd. of China at 9.2% share, followed by Toshiba at 5.6% share. (IBM sold its PC unit to Lenovo in May 2005.)

Apple Inc. (formerly Apple Computer Inc.) was absent from the list of top five global PC vendors from 1999 through 2009. This fact stands in sharp contrast with Apple's position as of mid-1994, when the question was whether Apple was No. 1 or No. 2 in worldwide PC shipments. Reasons for the company's diminishing share in that period included its well-publicized internal problems, aggravated by a fiercely competitive market.

More recently, however, things have been looking up for Apple. Its successful digital music player, the iPod, and the new iPhone have created what some consider a "halo" effect: the thesis suggests that iPod and iPhone customers may also buy Mac computers. This may also hold true for the upcoming iPad product line. We think this has been a key factor in Apple's improvement in US market share from 3.3% in 2004, to 4.0% in 2005, 4.7% in 2006, 6.2% in 2007, 7.9% in 2008, and 8.0% in 2009. Other factors include the Mac's innovative design, reputation for being reliable and user-friendly, and popularity with the youth market. We expect continued market share gains for Apple in 2010.

## SERVER MARKET FADES WITH ECONOMY

After two years of declines, the server market had a short-lived respite in 2000, when it advanced 6.5% to \$60 billion, boosted by the Internet build-out. However, it faced a dramatically different environment in 2001, when the market slid roughly 17.0% to \$50.1 billion, according to IDC. In 2002, worldwide server factory revenues declined another 12% to \$44.1 billion, reflecting a slump in IT spending amid the US economic downturn.

**WORLDWIDE LEADING SERVER FACTORY REVENUE, BY VENDOR**  
(Ranked by 2009 factory revenues)

	REVENUES			MARKET SHARE (%)	
	2008	2009	% CHG.	2008	2009
IBM	16,937	14,191	(16.2)	31.8	32.9
Hewlett-Packard	15,759	12,885	(18.2)	29.6	29.9
Dell	6,196	5,226	(15.7)	11.6	12.1
Sun Microsystems	5,373	3,825	(28.8)	10.1	8.9
Fujitsu/Fujitsu Siemens	2,508	2,186	(12.8)	4.7	5.1
Others	6,453	4,848	(24.9)	12.1	11.2
Total	53,226	43,161	(18.9)	100.0	100.0

Source: IDC.

From 2003 to 2005, the server market improved, led by demand for volume servers. Worldwide server revenues grew to \$46 billion in 2003 and \$49 billion in 2004, as the market witnessed strong growth in volume servers. In 2005, the server market

posted an increase to approximately \$51 billion in revenues, followed by a modest rise of about 1% to \$52.5 billion in 2006, according to IDC data. Figures from IDC show worldwide server revenues increasing about 5% to \$55.1 billion in 2007, but then falling by 3.3% to \$53.3 billion in 2008, and by 18.9% to \$43.2 billion in 2009. Standard & Poor's projects that server sales will rebound with IT spending in 2010, and recover further in 2011. Nevertheless, we expect pricing pressure to limit revenue potential in servers in the long run, and submit that this is one factor driving the server makers to try "server-plus" growth strategies, to coin a phrase, wherein the server is a means to sell software and services as a total data center package with higher growth and margin potential.

IBM maintained its leadership position in the server market during 2009, according to IDC, with a 32.9% share of revenues, a market share gain of about 1.1%. HP kept its hold on the No. 2 spot, with a 29.9% share, a gain of 0.3% from 2008 levels. Dell was in third place with a 12.1% share, a gain of about 0.5%. Sun Microsystems Inc. was fourth, with market share of 8.9%, down 1.2% from 2008. Somewhat distant in fifth place was Fujitsu/Fujitsu Siemens with market share of 5.1%, about 0.4% higher than in 2008.

A note about the server data presented here: While total server industry vendor shares for 2009 were available as this *Survey* went to press in early April 2010 (as shown in the table above), the subcategory shares—for volume, mid-range, and high-end servers—were not. We have provided 2008 data in the tables on the following pages to give our readers some guidance on vendor shares within each subcategory. And, given what we know about the segment as a whole in 2009, we believe the totals for the subcategories will be distinctly lower than in 2008, with Sun's position trimmed back to match up with the 2009 industry totals described above.

### Volume servers experience slowdown

As desktop computers have become increasingly powerful, the distinctions between hardware categories have blurred. In the mid-1990s, PC vendors began broadening their product lines with high-performance Wintel desktop machines capable of operating as servers. This caused explosive growth for the so-called volume server segment (the low end of the server market), with double-digit revenue gains in 1996 and 1997. In 1998, revenue gains subsided as the overall sales mix reflected the increased proportion of these servers based on processors from Intel Corp., among other factors.

#### WORLDWIDE VOLUME SERVER REVENUES

(Ranked by 2008 factory revenues)

	REVENUES ----- (MIL. \$) -----			MARKET SHARE (%)	
	2007	2008	% CHG.	2007	2008
Hewlett-Packard	10,859	10,587	(2.5)	35.6	36.7
Dell	6,261	6,197	(1.0)	20.5	21.5
IBM	5,208	4,332	(16.8)	17.1	15.0
Sun Microsystems	2,321	2,259	(2.7)	7.6	7.8
Fujitsu/Fujitsu Siemens	1,166	1,206	3.4	3.8	4.2
NEC	646	726	12.4	2.1	2.5
Rackable Systems	317	199	(37.2)	1.0	0.7
Hitachi Ltd.	179	184	2.8	0.6	0.6
Langchao	96	109	13.5	0.3	0.4
Lenovo	99	107	8.1	0.3	0.4
Apple	102	102	0.0	0.3	0.4
Acer	101	97	(4.0)	0.3	0.3
Toshiba	80	82	2.5	0.3	0.3
Powerleader	59	65	10.2	0.2	0.2
Maxdata	56	37	(33.9)	0.2	0.1
Other	2,958	2,566	(13.3)	9.7	8.9
Total	30,508	28,854	(5.4)	100.0	100.0

Totals may not add due to rounding. Percentages are based on unrounded data.

Source: IDC.

In 1999, however, sales of volume servers rose 10% to more than \$29 billion. Because these servers can be used as front-end servers supporting both online offerings and commerce (or e-commerce), demand was buoyed by the build-out of the Internet. Computer hardware additions were required to support the growing number of users accessing the Internet.

Following a slump during the economic recession, the market began to recover in 2002. Revenues advanced 4.9% in 2002, according to IDC, and gained further momentum in 2003 to rise 9.7%. In 2004, the market accelerated and volume server revenues rose 17.6% to \$23 billion. In 2005, strong unit growth pushed the volume server category to represent 90% of all server units, and over half of total server revenues, according to IDC. The volume server segment still represents more than half of total server revenues, at about 54.1% in 2008.

Still, the revenue growth rate for volume servers ebbed from the strong levels of 2004, to 12.1% in 2005, followed by a modest rise of only 4.4%



in 2006, an increase of 8.5% for 2007, and a decrease of 5.4% for 2008. Revenues totaled about \$30.5 billion in 2007 and \$28.9 billion in 2008, according to IDC data.

For 2008, the leading market share winner in the volume server category by revenue was HP, which witnessed some market share expansion to 36.7% in that year (from 35.6% in 2007), as its revenue decreased about 2.5%, which was about half the pace of decline for the volume server industry. Dell continued in the No. 2 spot, with 21.5% share in 2008, an improvement from its 20.5% share in 2007, and

its revenue decline in the segment was only 1.0%. IBM followed with 15.0% share in 2008 (down from 17.1%), and its revenue fell 16.8%. Sun was fourth with a 7.8% share in 2008 (slightly improved from 7.6% share in 2007), on a revenue decline of 2.7%. Of the five largest competitors, IBM seemed to suffer the most in the volume server segment in 2008.

#### WORLDWIDE MIDRANGE SERVER REVENUES

(Ranked by 2008 factory revenues)

	REVENUES			MARKET	
	----- (MIL. \$) -----			SHARE (%)	
	2007	2008	% CHG.	2007	2008
IBM	5,450	5,295	(2.9)	42.9	45.0
Hewlett-Packard	2,993	2,896	(3.2)	23.6	24.6
Sun Microsystems	2,653	2,272	(14.3)	20.9	19.3
Fujitsu/Fujitsu Siemens	775	505	(34.9)	6.1	4.3
NEC	153	181	18.5	1.2	1.5
Groupe Bull	164	170	3.9	1.3	1.4
Unisys	183	140	(23.6)	1.4	1.2
Teradata	24	79	231.0	0.2	0.7
SGI	74	70	(5.6)	0.6	0.6
Hitachi Ltd.	80	54	(32.5)	0.6	0.5
Stratus Computer	69	51	(26.6)	0.5	0.4
Mitsubishi	31	33	6.9	0.2	0.3
Toshiba	5	6	10.8	0.0	0.1
Dell	0	3	812.5	0.0	0.0
Samsung	7	2	(76.4)	0.1	0.0
Other	36	4	(90.0)	0.3	0.0
Total	12,698	11,759	(7.4)	100.0	100.0

Totals may not add due to rounding. Percentages are based on unrounded data.

Source: IDC.

#### HIGH-END SERVER REVENUES

(Ranked by 2008 factory revenues)

	REVENUES			MARKET	
	----- (MIL. \$) -----			SHARE (%)	
	2007	2008	% CHG.	2007	2008
IBM	6,678	7,361	10.2	56.0	57.9
Hewlett-Packard	2,189	2,268	3.6	18.4	17.8
Fujitsu/Fujitsu Siemens	735	856	16.4	6.2	6.7
Sun Microsystems	893	845	(5.4)	7.5	6.6
NEC	216	388	79.9	1.8	3.1
Hitachi Ltd.	350	274	(21.7)	2.9	2.2
Unisys	200	222	11.0	1.7	1.7
Cray Inc.	131	218	67.1	1.1	1.7
Teradata	43	114	162.9	0.4	0.9
Groupe Bull	130	96	(25.9)	1.1	0.8
SGI	86	73	(15.4)	0.7	0.6
Stratus Computer	18	2	(88.8)	0.2	0.0
NCR	253	...	NA	2.1	...
Mitsubishi	2	...	NA	0.0	...
Total	11,925	12,718	6.7	100.0	100.0

Totals may not add due to rounding. Percentages are based on unrounded data. NA—Not applicable.

Source: IDC.

#### Midrange servers: battle among the top three

The midrange server market (typically higher-end systems running the Unix operating system) suffered the hardest blow from the IT slowdown in 2001, and worldwide revenues have remained under pressure since the tech slump. The rate of decline lessened a bit in 2003, with factory revenues down 0.6% to \$13.7 billion, but then came a drop of 8.4% in 2004, according to IDC. In 2005, the midrange server market rose 4.8% to \$13.2 billion. However, this category eroded again in 2006, as revenue decreased to \$12.6 billion, but then stabilized near \$12.7 billion in 2007. Revenues for mid-range servers fell about 7.4% in 2008 to \$11.8 billion.

IBM, HP, and Sun continue to dominate this market, according to IDC. In 2008, these three vendors accounted for almost 89% of revenues in the midrange server market. IBM reported a revenue decrease of 2.9% in 2008, while its share rose to 45.0% from 42.9% a year earlier, based on IDC data. HP's revenues declined 3.2%, and its share of this segment expanded to 24.6% from 23.6%, keeping it in the No. 2 spot. Sun's revenues decreased more sharply, about 14.3%, and its share of this market dipped to 19.3%, from 20.9%, as it remained third on the list. The No. 4 player, Fujitsu/Fujitsu Siemens saw its market share decline to 4.3% from 6.1%, as its revenue decreased 34.9%.

#### High-end servers: IBM leads segment

The high-end server category includes a variety of platforms—supercomputers, mainframes, and minicomputers—in varying stages of maturity. While total server market sales increased sharply in the late 1990s, the high end suffered as customers increasingly off-loaded applications that were

traditionally found on mainframes and minicomputers to midrange servers and even high-powered PC servers. Weak US corporate profits in late 2000 through 2001 further hurt demand, and the global economic downturn muted results in 2002. IT budgets remained under pressure in 2003, and the market for high-end servers continued to slide, down 5.4% to \$12.4 billion, according to IDC. The market staged a modest recovery in 2004, with revenue growth of 1.5%, aided by strength in IBM's mainframe sales as the company transitioned its mainframe line. The segment's downward trend resumed in 2005, and revenue decreased to \$11.9 billion in 2007. High-end server revenue increased about 6.7% to \$12.7 billion in 2008.

For high-end servers, IBM remained the clear leader in 2008. Its market share increased to 57.9% in 2008 from 56.0% in 2007, as revenues increased 10.2%. HP followed with 17.8% of the market, down from 18.4% in 2007, as its revenues rose 3.6%. Fujitsu/Fujitsu Siemens narrowly regained the third spot, with a market share of 6.7%, compared with 6.2% in 2007, as its revenue grew 16.4%. Sun Microsystems saw its revenue drop 5.4%, contributing to a narrowing of market share to 6.6% from 7.5%. Together, these top four vendors controlled 89% of the high-end server market segment.

## **WORKSTATION MARKET SHIFTS TO LOWER-END PRODUCTS**

In 2008, workstation shipments rose about 8.4% to almost three million units, according to IDC figures. The workstation market continued an upward trend as revenues increased by about 3% to about \$6.2 billion, from about \$6.1 billion in 2007, as average selling prices fell 5.1% to \$2,094 per unit, according to IDC. This followed a strong year in 2007, in which units rose 24%, and ASPs rose nearly 2%, combining for a 26% increase in revenues from 2006.

Workstations, the industry's fastest-growing sector in the late 1980s, were unique in that they combined powerful processors, networking, and graphical user interfaces in a single compelling package for the first time. They were aimed at engineering, three-dimensional animation, and scientific applications. In the past, Unix vendors dominated this area, accounting for some 85% to 90% of the market. However, as the segment has shifted to lower-end personal workstations from higher-priced Unix workstations, Unix vendors' share has fallen in recent years, accounting for about 7.5% of total workstation revenues in 2008, according to IDC data. Desktop computers using Intel's processors and Microsoft's Windows operating systems, which have become more powerful, now offer a compelling (and cheaper) alternative.

Standard & Poor's believes that a slow drift toward lower prices combined with a weak economy scuttled opportunities for workstation growth in 2009. We foresee a chance for unit shipment growth to recover somewhat in 2010 and surpass 2008 levels in 2011. Market leaders in workstation lines are Dell and HP.

## **INDUSTRY TRENDS**

Spending on computer hardware, defined as server and client (PCs and workstations) systems, represents about a fifth of the worldwide spending on information technology (IT). More broadly defined to include storage disk systems and tape, peripheral equipment such as printers, and networking equipment, as well as the server and client computer systems, computer hardware is about 40% of total IT spending. According to market researcher IDC, IT spending reached roughly \$1.5 trillion in 2008, and then fell about 4.5% (in constant currency terms) to about \$1.43 trillion in 2009. In 2010, IDC projects that such spending might rise back about 3% to a \$1.48 trillion level, thus not quite regaining the 2008 level. To put this current level of nearly \$1.5 trillion in perspective, the worldwide IT market was valued at nearly \$1.0 trillion in 2001 and just \$360 billion in 1993.

What propelled this stellar growth? The Internet. Widespread use of the Internet stimulated demand for a host of IT-related products and services. In 1998, an estimated \$211 billion could be linked to technology investments related to the build-out of the Internet, according to IDC. Spending for online infrastructure was estimated at \$600 billion in 2003.

While the investment boom may take a pause during years of slow economic growth, as occurred in 2001 and 2002 (with declines of 0.5% and 4.1%, respectively, according to IDC), and in 2009, we think the longer-term

outlook remains positive. We believe IT spending increased at a 6% to 7% annual pace in 2005, 2006, and 2007, but dipped to a slower growth level near 3.6% in 2008, and decreased about 4.5% in 2009, as a result of the global economic slowdown. Because infrastructure development is needed to meet growing demand from new users and for new applications, Internet-related spending should continue to rise.

## **US PC MARKET GROWS IN SPURTS**

Just when the computer hardware industry was considered mature in the latter half of the 1990s, the industry witnessed a resurgence ushered in by the Internet age. Demand to get online—coupled with the proliferation of low-priced (in some cases, even free) PCs—bolstered demand in the US through 1999. According to IDC, US PC unit shipments increased by 27% and 24% in 1994 and 1995, respectively. When annual growth slipped to 15% in 1998, many observers concluded that growth in the US was decelerating because of a saturated market. Then, in 1999, US PC shipments surged 25%.

From 2000 through 2002, however, PC sales growth slumped in the United States. According to Gartner Dataquest, an IT market research firm, US PC shipments rose less than 8.0% in 2000, declined approximately 11.0% in 2001, and grew by 4.4% in 2002. Picking up the trail from there, figures from IDC show that US PC shipments grew about 10.8% in 2003, 10.5% in 2004, and 8.5% in 2005. Growth decelerated in 2006, with US unit shipments up only 3.6%. Growth improved in 2007, but only to about 7.6%. Results for 2008 were an increase of only 2.1%, followed by a similar lackluster increase near 2.0% in 2009. We expect a substantially higher increase for 2010, probably topping 10% growth.

Market concentration became noticeable by the late 1990s. It then became pronounced with the combination of Hewlett-Packard Co. (HP) and Compaq Computer Corp. in 2002, Gateway Inc.'s acquisition of eMachines Inc. in 2004, and International Business Machines Corp.'s (IBM's) sale of its PC unit to China-based Lenovo Group Ltd. in May 2005. The consolidation trend continued when Taiwan-based Acer Inc. acquired Gateway Inc. in October 2007. In addition, computer hardware vendors have broadened their product offerings to offset declining margins. These companies are now becoming more focused on cash management and on higher inventory turns and returns on assets.

While the PC industry is certainly maturing, in Standard & Poor's opinion, there are still geographic areas where PC penetration is well below saturation levels. In addition, the introduction of higher performance products and Internet services (including broadband access) will likely continue to boost demand over the next several years, sustaining unit growth in the high single-digit range over that period.

## **CONSOLIDATION EXTENDS TO SERVICES**

The computer industry has long experienced consolidation in hardware operations, and Standard & Poor's expects the consolidation trend to expand to emphasize software and services, as companies strive to produce one-stop shopping convenience for information technology customers, add recurring revenue streams to aid earnings stability, and increase economies of scale to help profitability.

The largest merger in the industry to date was the May 2002 acquisition of Compaq by HP, valued at some \$19 billion. Before that, the largest merger was Compaq's June 1998 acquisition of Digital Equipment Corp. (DEC), valued at \$8.4 billion. Among other mergers, Packard Bell and NEC Corp. combined forces in 1997. (After a series of investments of more than \$1.3 billion, NEC shuttered the Packard Bell brand in the United States in 1999.) As mentioned earlier, Gateway acquired eMachines in March 2004 for an estimated \$250 million, and China-based Lenovo Group acquired IBM's PC division in May 2005 for about \$1.75 billion. Acer purchased Gateway in October 2007 for about \$710 million.

Acquisition strategies have let companies broaden their customer base and offer a wider array of computing products and services. Over the past several years, Sun added personnel to beef up its services offerings and has forged alliances with computer services companies. Compaq's acquisition of DEC provided it with high-end Unix systems and a worldwide service organization. HP now holds not only the former Compaq service assets, but also the large technology services capacity of Electronic Data Systems Corp., which HP acquired

in August 2008 for about \$13.9 billion. This allows HP to present customers with broad offerings in hardware, software and services, along the lines of a model pursued at larger-scale IBM.

IBM, the global leader in services, acquired the consulting unit of PricewaterhouseCoopers International Ltd. in July 2002. (Some two years earlier, HP had been in discussions to acquire the unit.) Since then, IBM has engaged in a string of software and service acquisitions. The company made 12 acquisitions in 2007 for a total cost of \$1.1 billion, of which six were in software and five were in services. A headline deal for IBM was the February 2008 purchase of Ottawa-based Cognos for approximately \$5 billion, which added expertise in business intelligence software and services to help facilitate customers' real-time decision-making based on their data. IBM's revenue in 2009 came 58% from services, 23% from software, 17% from hardware, and 2% from financing, illustrating a diversification among segments with a tilt favoring services and software lately. Hardware appears to be something of a loss leader by which IBM attracts business for other segments.

As networks of computers have become larger and more complex, customers increasingly prefer to use a single vendor for all of their computing platforms. This provides one source of accountability and enables easier technology upgrades. Standard & Poor's believes this trend will promote further consolidation ahead.

## COMPETITIVE PRICING EVERYWHERE

Several factors have affected computer hardware pricing and sales trends. While chip prices continue to fall and disk drives experience price declines (beyond the steady component price declines), the industry's consolidation has also enabled computer companies to trim operating expenses. Consolidation, however, has also contributed to a more intensely competitive pricing environment that continues to weigh on all computer hardware categories. Vendors try to offset price declines by achieving better volumes via market share gains, and the competitive cycle continues.

In the discussion that follows, we present some context for the pricing pressures at work in the various segments of the computer hardware industry.

◆ **PCs.** Price competition has been the hallmark of the PC market. One reason is that PCs have become more commodity-like with the standardization of their primary components. Microsoft Corp.'s Windows operating system software is used in an estimated 85%–90% of PCs worldwide, and Intel Corp.'s processors are used in approximately 80%.

Price competition in the PC market became fierce in 1992, when Compaq's price actions precipitated a shakeout among second- and third-tier suppliers. Compaq led the charge again in 1997, dominating the sub-\$1,000 PC market at the low end of the market and challenging the price points of direct sellers such as Dell at the high end. Over the past few years, prices have continued to erode, particularly in the desktop market, as demand for notebooks has accelerated.

Traditionally, direct sellers have been able to underprice indirect sellers like Compaq and HP, which sell through retail channels. This is because direct sellers yield savings by maintaining low inventory levels. In addition, they do not have to pay the incentives or price guarantees that indirect sellers typically pay resellers. However, many PC makers who sell indirectly are now also using the direct sellers' techniques—such as online order capabilities and build-to-order strategies—to gain efficiencies and narrow price gaps, as well as reduce their cost structures to compete better on price.

◆ **Servers.** In contrast to the PC market, the explosive growth in servers in the late 1990s attracted new entrants. PC server participants, lured by growth rates of 25%+ projected for this segment, further stimulated the market with dramatic price cuts. Demand also benefited from a technology migration to systems with Intel's server-based chips (originally Pentium Pro, followed by Pentium II/III processors and the newer Pentium IV, launched in 2000, and Itanium in 2001) and Microsoft's Windows NT Server and Windows Server 2000 operating systems. Windows Server 2003, released in April 2003, witnessed traction with users in 2004, as shipments of paid new licenses for this operating system more than doubled. Additional gains of 23.7% and 13.8% were attained in 2005 and 2006, respectively.

◆ **Workstations.** Growth in this area has been challenged as manufacturers have faced PC-like pricing pressures given the influx of PC-based units. Revenues have also been under pressure as the lower-priced Windows NT workstations have grown at a faster pace than traditional workstations. (Traditional workstations use the Unix operating system and reduced instruction set computer, or RISC, microprocessors.)

◆ **Large-scale systems.** Pricing pressures on large-scale systems like mainframes have been well documented. US businesses are actively moving mainframe applications to other computer platforms, mostly to client/server systems and local area networks (LANs). The competition from the popular client/server and LAN environments has forced mainframe vendors to become more price-competitive. In recent years, however, mainframe makers, led by IBM, have introduced easier, cheaper systems that use complementary metal oxide semiconductors (CMOS). Migration to these new machines should sustain unit growth, partly offsetting the pressure on revenue growth.

### **PCs keep getting cheaper...**

As the PC market matures, manufacturers have addressed affordability and innovated to expand market opportunity. In the consumer market, industry studies through early 1997 showed that the majority of US households with incomes higher than \$50,000 had already purchased a PC. The typical price point for a PC at that time—\$2,000—was out of reach for many less affluent consumers, so analysts argued that the home PC market was saturated.

Since then, however, PC vendors have responded with lower prices, and sales have proliferated. By the late 1990s, all major vendors offered a PC priced at less than \$1,000. By 2006, desktop models could be bought for less than \$500, and laptops for less than \$700. The sub-\$1,000 PC has succeeded in raising the penetration of PCs in the home market; by IDC estimates, more than three quarters of all US households now own a PC.

With the popularity of sub-\$1,000 PCs, the outlook for PC vendors' profitability became a critical issue in 1999. All major PC vendors have had to adjust their cost structures. The major indirect PC vendors have enacted some form of build-to-order manufacturing strategy (as opposed to the prior build-to-forecast method), in order to achieve savings by maintaining lower inventory levels. The drive to lower costs was among the forces behind the 2002 merger of HP and Compaq. Indeed, in recent years, all the major PC vendors have struggled to try to emulate some aspect of the low-cost business model perfected by Dell.

In addition, while lowering their base prices, PC vendors have tried to augment the potential add-ons for each PC sold by increasingly offering system upgrades, software, peripherals, financing, warranties, and other services to customers. Particularly in the business market, where PCs often are tied into network systems, studies have revealed that the total cost of a PC is reflected less in the up-front price paid for the device and more in the maintenance and support of the computer following the purchase.

### **...as do Intel processors**

As Intel introduces each new processor, it aggressively drives down prices of older processors. This makes PCs based on older chips more affordable to a broader market. For example, when the 233 megahertz (MHz) version of Intel's Pentium II was introduced in mid-1997, chips were priced at \$636 each; by January 1998, they were \$268—a 58% drop in about six months. Similarly, the list price of a 600 MHz Pentium III desktop processor was \$615 in September 1999, but dropped 61% to \$241 by February 2000.

Price cutting accelerated with the Pentium IV. In July 2001, Intel's 1.8-gigahertz (GHz) Pentium IV processor carried a list price of \$562 each; by the end of August, it was \$256, and, in March 2002, it was \$193. By February 2003, less than a year later, you could get a 2.5 GHz Pentium IV (a 40% hike in computing power) for the same \$193. By February 2004, a 2.8 GHz Pentium IV was \$178; and by January 2006, that same \$178 was the price point for a 3.0 GHz Pentium IV. As of March 2010, Intel could offer its Pentium processor line for less than \$90 per unit. An Intel Core 2 Quad processor with 2.66 GHz was offered at \$163, and a low power version (for laptops) was available at \$213. Meanwhile the Intel Atom processor for netbooks, with 1.66 GHz, 2 cores and 4 threads, was offered in March 2010 for \$63. (For further discussion of semiconductors, please see the *Semiconductors Industry Survey*.)

## WINTEL'S ROLE IN THE UPGRADE CYCLE

Demand for new computers typically accelerates as users migrate to faster processors and/or new operating systems. This is known as the “upgrade cycle,” a trend that has proven powerful in the PC business. The upgrade cycle assumes that users will trade up to PCs that are more powerful when a new operating system is released, thus stimulating hardware sales. This happened in 1995, when the introduction of Microsoft's Windows 95 caused a surge in PC shipments: in order to handle the new operating system, consumers needed to upgrade to more robust PCs.

The upgrade cycle was again apparent in the first quarter of 1997, when US PC shipments grew 20%, the highest year-to-year increase since 1995. This growth was buoyed by migration to MMX (Intel's multimedia software instruction set), as well as by a continuing wave of corporate upgrades to Pentium Pro machines with Windows NT.

The combination of Windows operating systems and Intel processors has been nicknamed “Wintel.” The Wintel dynamic is permeating almost all computer platforms, because of its compelling price/performance compared with the alternative: the reduced instruction set computer (RISC) processor/Unix operating system combination, which had long dominated multiuser systems and workstations.

Another upgrade cycle was launched with Microsoft's Windows 2000. However, there was a much more gradual uptake than in prior cycles. The operating system was officially launched in early 2000, but the momentum in user upgrades to the platform was less robust than early predictions. The industry was also expected to witness an upgrade cycle in 2002 with the introduction of Windows XP, which was launched on October 25, 2001. Both of these upgrade cycles—the former aimed at the business market and the latter at consumers—were limited by the US economic downturn in 2001 and 2002.

The next major upgrade from Microsoft began with the launch of Vista. The enterprise version was released in November 2006 and the consumer-based offering debuted in January 2007. Adoption rates have been slower than in previous Microsoft versions; reasons include mixed reviews of the product and what we view as a lack of compelling new technological features, despite some product enhancements. The latest PC operating system from Microsoft is Windows 7, available since autumn 2009. This version has been generally well received and may release some pent-up demand from PC users who sought to skip the Vista era and thus have aging PCs.

## INTERNATIONAL MARKETS OFFER LONG-TERM GROWTH

International markets present a promising opportunity for computer hardware vendors in the years ahead. Areas like the Asia/Pacific region (excluding Japan) and Latin America witnessed stronger growth rates than the worldwide average in the mid-1990s. From late 1997 through 1998, however, economic difficulties dampened PC growth in those regions, while the more mature markets of the United States and Europe continued at a healthy pace.

In 2000, however, the tables turned, with Asia/Pacific, Japan, and Latin America again leading worldwide unit growth. For example, US unit shipments increased just 8.0%, while growth in the Asia/Pacific region surged 38.0%. In 2001, according to IDC, Asia/Pacific was the only region to sustain shipment growth on a year-over-year basis, and in 2002, Asia/Pacific's 10.0% growth again outpaced other major regions: the US saw 3.2% unit growth for the year, and Europe saw growth of just 1.8%.

In 2003, Asia/Pacific continued to perform well, with shipments up more than 14.0%. However, Europe recovered strongly and surged 19.0%, and US shipments rose a respectable 10.8%, according to IDC. In 2004, the double digit-pace of growth continued with US shipments up 10.6%, while Europe's shipments again surged 18.9%, and Asia/Pacific's growth accelerated to 16.6%. By 2005, US growth had slowed to 9.6%, while Western Europe and Asia/Pacific's growth again accelerated to 16.2% and 23.3%, respectively. In 2006, US growth decelerated even further, with shipments up only 2.5%, while Europe expanded by 5.6%, but Asia/Pacific continued its torrid pace, with a rise of 18.1%.

### **Asia/Pacific expected to outpace the United States**

In 1996, the Asia/Pacific region (excluding Japan) was the fastest-growing PC market in the world, with overall sales gains in the mid-30% range. As mentioned earlier, the region took a breather in late 1997 and in 1998; according to IDC, shipments to the region rose by a less robust 14% in the fourth quarter of 1997, and annual shipments declined 0.6% in 1998.

In 1999, shipments in the region surged 35.0% (versus US growth of 23.8%) to 14.4 million units, or 12.7% of total world shipments in that year. Then, in 2000, the region's shipments rose 41.2%, led by consumer demand to access the Internet. Growth in Asia/Pacific shipments moderated to 8.8% in 2001, but then accelerated to 10% in 2002, more than 14% in 2003, nearly 17% in 2004, about 24% in 2005, 19% in 2006, and 22% in 2007, before slowing to 9% in 2008 and 12% in 2009, reflecting a global economic slowdown.

We think the growth trajectory for the Asia/Pacific region still looks positive, following the 2009 slowdown. Indeed, over the next several years, the Asia/Pacific market is expected to continue to expand faster than the US market. IDC projects that Asia/Pacific (excluding Japan) will increase at a compound annual rate of 16% or better for each year from 2010 to 2013, while the US may struggle to surpass 9% unit growth in any of those years. Similarly, IDC's forecast for the ROW (rest of world) category for 2010–13 projects compound annual growth rate of 10% or better in each year—not quite keeping pace with Asia/Pacific, but showing superior growth compared with most other regions in most years.

### **HOW THE INDUSTRY OPERATES**

The modern computer hardware industry began in the early 1980s with the introduction of the personal computer (PC). Before then, computing was dominated by International Business Machines Corp.'s (IBM's) mainframes and confined mostly to computer professionals and scientists.

The Altair 8800—the first commercially successful PC in the early 1970s—spawned much of what is thought of as modern computing. In a general sense, the Altair 8800 provided the seeds for the eventual introduction in 1981 of IBM's PC. In a more narrow sense, the Altair introduced two key concepts that remain critical to computer hardware manufacturers to this day. First, because the Altair was mass-produced, the manufacturer was able (eventually) to obtain Intel Corp.'s 8080 chips at an attractive price. Second, the Altair was based on an open-systems architecture.

Furthermore, it was the Altair, gracing the cover of *Popular Electronics*, a magazine aimed at the electronics hobbyist, on January 1, 1975, that inspired Bill Gates and Paul Allen to develop a version of BASIC, the first language program for a PC. Following the Altair, there was a rash of introductions of other personal computing devices, including the Commodore PET, RadioShack Corp.'s TRS-80, and the Apple II from Steve Wozniak and Steve Jobs. At that time, however, these PC devices were mainly the province of hobbyists.

In 1981, IBM introduced the IBM PC, launching the PC market and transforming the industry forever. The PC not only brought computers to a broader customer base, it also was one of the first IBM products to adopt an “open architecture,” in which IBM revealed the instructions and specifications. This enabled other companies to develop their own PC “clones” that would be compatible with IBM's machine, as well as peripheral devices, such as external storage, printers, and video and sound devices, among others.

This open architecture quickly evolved into a de facto industry standard. It included a microprocessor from Intel and the Windows operating system from Microsoft Corp. with its graphical user interface, which eliminated the need for users to remember the arcane commands required by its predecessor operating system, MS-DOS. Once computer makers were able to clone IBM's PC based on its open-standard architecture, PC sales took off and prices came down. This effectively began the “commoditization” of the PC, which is still a major force in the economics of the industry.

The development of the PC coincided roughly with the birth of today's other major computing platforms: servers and workstations. Servers, which at their most basic function closely resemble PCs, are used in corporations and governmental or educational enterprises to handle large computing needs. They have become so widespread that mainframes, while technologically distinct, are now categorized as another class of server. Together with the PC, servers created a new model of computing known as the client/server model, in which a "client," normally a PC, requests a file or other information from a server via a network connecting the two. This allows the more powerful server to share its resources with many other, less powerful client computers.

Workstations are the other major computing platform. Introduced in 1982 by Sun Microsystems Inc., they too are closely related to PCs. Essentially, they are high-end PCs with advanced graphics capabilities that are designed to handle data-intensive scientific and engineering applications. Of the three categories that now make up the computer hardware industry, PCs represent over 80% of global revenues.

## **COMPUTER FORM FACTORS**

Just about every type of computer comes in a variety of "form factors," or physical designs that play a large role in determining the computer's potential uses and markets. The most common form factor distinction in the PC market is that between desktop and laptop (or portable) computers. Laptops contain similar electronics to desktops, but they must also meet a unique set of requirements, such as reduced power usage and heat generation. Historically, a laptop or portable PC typically meant a notebook-sized computer, but in recent years, a smaller "ultraportable" form factor—often called a mini-notebook or netbook—has begun to emerge as another type of laptop that allows users to connect to the Internet while on the go.

Servers and workstations also come in a variety of form factors. In recent years, "blade" or rack-optimized servers, which are simply circuit boards designed to standard specifications, have grown popular with corporations and other enterprises. They allow customers to create standardized, expandable computer racks and easily add or remove individual servers.

## **ASSEMBLERS, MARKETERS, AND MANUFACTURERS**

The companies that produce PCs, servers, and workstations are often thought of as manufacturing companies, yet in reality, they do little more than assemble a standard set of components bought from various third parties. Since these components are often sourced from the same manufacturers, there is little real difference in the functional performance of most similarly equipped computers.

Computers are made from a relatively small list of components. At the heart of a computer is the motherboard—a circuit board that holds the essential electronics of the computer. These include the microprocessor or central processing unit (CPU), memory chips, the program needed to start the computer, connections for add-on features like sound and video, and the circuitry known as the "bus," which transmits information to and from the processor.

Most computer hardware vendors buy motherboards already assembled. From there, they add a source of power, cables, disk drives, and a case to house them all—each usually sourced from outside as well. A keyboard, mouse, and display screen, also sourced externally, usually accompany the computer. The hard drive is the primary PC storage medium. IBM developed the first hard disk in 1956, but Seagate Technology LLC introduced the first hard disk for PCs in 1979.

Many of the most recognized computer hardware vendors, including Dell Inc., Apple Inc. (formerly Apple Computer Inc.), Hewlett-Packard Co. (HP), and NEC Corp., assemble various components and market them to customers. Apart from IBM and, at least through 2009, Sun Microsystems (through its relationship with Texas Instruments Inc.), very few assemblers manufacture the microprocessors and other chips that actually make a computer work, and even these companies have begun to purchase motherboards and other components from third-party sources for their low-end PCs and servers.



Of course, relying on outside suppliers for crucial parts involves risk. Potential issues include defective parts, shortages, price increases, and reduced control over delivery schedules. Notably, Intel supplies about 85% to 90% of the microprocessors used in PCs, giving it enormous power over assemblers. Any or all of these factors can be significant to an assembler's profitability.

Computer assemblers, as well as the actual component manufacturers, are often referred to as original equipment manufacturers (OEMs). While many assemblers are not true manufacturers, they are grouped as such in order to differentiate them as wholesale buyers that are distinct from the retail market for computer components.

### **Dell: still the low-cost producer?**

OEMs use various methods to assemble computers, and these can have a significant impact on their profitability. For years, the acknowledged low-cost producer in the global computer industry was Dell. The company employs a unique "direct" sales method, where customers order PCs (and, more recently, servers and other types of computer equipment) either via the Internet or on the telephone, choosing the exact specifications they want. The computer is then custom-assembled and shipped to the buyer.

Dell's direct-sales business model—which, despite the efforts of some, has not been successfully duplicated elsewhere—offers key advantages that keep costs low. By selling directly to end users, the company can keep the markup normally charged by a retailer or pass it on to consumers by way of lower prices. In addition, building each computer to custom specifications after the order has been placed greatly reduces the costs and risks of holding inventory, both for components and finished computers. Dell measures some of its inventory in production hours rather than days. This is especially important in an industry with short product lifecycles.

Direct sales also help a firm keep close tabs on current demand trends, allowing it to reduce or expand inventory more quickly than other OEMs that are several steps removed from the actual purchaser. This helped Dell manage through the downturn in PC sales that began in 2001 much better than others did, in our opinion. Throughout that high-tech recession, in which many computer hardware vendors lost billions, Dell posted only one quarterly net loss.

More recently, however, Dell's model has faced serious challenges. In our opinion, this is largely due to its lack of presence in the retail marketplace. We believe many consumers prefer the benefits of this distribution channel, as it enables them to comparison shop in the store, where they can receive hands-on demonstrations and develop a greater sense for a product's capabilities and specifications.

Beginning in 2007, Dell has sought to expand its retail business via a strategy that borrows elements from its direct-sales strategy. The company partners with a few major retailers and aims to build computers that match each retailer's customer profile. This "mass customization" should result in efficiencies from focused production, low inventory, and close matching of typical customer needs. As of spring 2010, Dell's overall margin profile was changing, with some margins better and some worse, and, given strong pushes to expand outside of Asia by Lenovo and Acer, it is not as clear as it once was that the title of low-cost producer belongs to Dell. (See the "Current Environment" section of this *Survey* for further discussion of Dell's recent performance issues.)

### **Contract manufacturing**

In order to stay successful in this heavily competitive marketplace, many PC and server assemblers have tried to cut costs by shifting their assembly operations to companies providing electronics manufacturing services (EMS). These companies contract with hardware vendors to produce a certain product line for a given period. A further refinement of this model has led to the appearance of companies that offer design services as well as manufacturing, known as original design manufacturing (ODM) firms.

Contract manufacturing offers several potential advantages, even though it contributes risks of its own. Given the fluctuations in demand for PCs, contract manufacturers relieve computer assembly firms like Gateway Inc. and HP from owning and operating their own manufacturing facilities, which are expensive

burdens during times of weak demand and may not be capable of meeting production requirements when sales are strongest.

Companies, including HP, Apple, Sony Corp., Fujitsu Ltd., and Fujitsu Siemens Computers have endorsed this trend. IDC estimates global EMS and ODM revenues reached about \$280 billion in 2008; we estimate 2009 revenues may have slipped back about 16% toward \$235 billion, reflecting the IT spending downturn. We project EMS industry improvement near 6% in 2010 and a further rebound to recapture the 2008 level in 2012 or 2013.

## **DISTRIBUTION: DIRECT, INDIRECT, OR BOTH**

As computer technology has grown to permeate almost every area of the global economy, the number of distribution channels has expanded to meet the needs of buyers. Hardware vendors may use one or many different channels, including a direct sales force. The narrowing of profit margins in late 2000 through 2002 made hardware vendors much more aware of their distribution channels and more interested in improving their efficiency.

The most expensive and powerful computers are usually sold directly to the end user. These large systems, which cost \$1 million or more, are often specially configured for specific computing tasks and for optimal integration with the customer's existing computing infrastructure. Large-system vendors employ sales teams organized by industry or geography, or sometimes both. Field service engineers, other service personnel, and administrators support these sales operations.

Dell's direct model differs from the direct sales of large systems, in that it operates at the consumer level and relies on Internet and telephone sales rather than sales representatives who call on customers and negotiate specific purchases. Dell uses advertising and other marketing methods to draw consumers to the company's Web site and 800 numbers.

Although Dell focused exclusively on its direct sales channel until the past few years, the overall market has seen expanding methods of distribution. As computers have become more affordable and more standardized, the number of computer resellers has expanded greatly. Many of these sales outlets offer access to a great deal of technical expertise and can help the customer design complicated computing systems that integrate hardware and software from a variety of sources. These businesses are often known as value-added resellers (VARs), or system integrators (SIs). Value-added resellers use software that is developed internally or by a third party to create a system integrating hardware, software, and services. For example, Sun Microsystems typically got about two-thirds of its revenue from reseller channels, and while that proportion probably held true in 2009, its future sales patterns will be determined by the team at Oracle.

Achieving the proper balance between direct and indirect sales initiatives can be problematic. Direct sales can lower costs, but maintaining a strong partnership with distributors is critical to computer hardware vendors serving the enterprise market. In addition, sales of PCs through retail outlets—including manufacturers' retail locations as well as mass merchandisers, consumer electronics retailers, computer superstores, warehouse clubs, and office products stores—have accelerated as consumer purchases have accounted for a growing percentage of PC sales. Growth in this area has come at the expense of other distribution channels.

Manufacturers have had mixed results in running their own retail outlets. In past years, Gateway and others have had little success with this model, in part reflecting the higher costs of running "brick and mortar" operations versus virtual stores online. Now, however, Apple is gaining share in the consumer market in part because of the success of its retail locations. The upscale stores are staffed by highly trained sales and support representatives, and use effective merchandising techniques to highlight the distinctive design features of Apple's computers, iPods, and other products. As of the end of September 2009, the company had opened 273 stores worldwide.

## FASTER, SMALLER, BETTER

Contract manufacturing is the computer hardware vendor's latest response to the perilously short product life cycle for computers. For many of the industry's best selling products, particularly desktop and laptop PCs, it often seems that no sooner has a new product hit the market than a newer, faster, and smaller version emerges to take its place. Making the most of new product introductions is critical, with some industry analysts estimating that as much as 50% of the profits a product will create are generated during the first three to six months of sales.

One of the driving forces behind the short life cycles of PCs has been Intel's practice of regularly introducing new products with faster processing speeds and new features, while cutting prices on older product lines. This forces competitors, such as Advanced Micro Devices Inc., to cut prices as well, and leads PC vendors to slash prices on their now outmoded inventory. Other features drive product life cycles as well. The replacement of the floppy disk by the compact disc as a means of removable data storage drove sales of thousands of new PCs. Before that, color monitors were an important feature that drove a wave of new purchases.

Related to the product lifecycle is another phenomenon known as the "upgrade cycle." During most of the 1990s, corporations would routinely upgrade their desktop and laptop computers every three years or less, as processing speeds increased and new software programs (especially new operating systems) required greater storage capacity and memory. Coupled with the underlying economic expansion, these upgrades drove enormous growth in PC demand.

Helping to drive the upgrade cycle was the periodic appearance of a new application for the PC, known within the industry as a "killer app," which required more processing power, larger memory, or new features. Word processing was one of the earlier killer apps, as were spreadsheets. In the mid- to late 1990s, Internet access became the latest killer app, driving a new round of PC upgrades as millions of consumers bought new PCs that could surf the World Wide Web, send e-mail, and place orders online.

The last major upgrade cycle took place in 1999, as consumers rushed to buy PCs that were free of the "millennium bug." Since that time, there has been no major upgrade—though some might view the double-digit growth during 2003, 2005, and 2007 as reflecting muted upgrade cycles (*i.e.*, unit growth never exceeded 20%, as was typical of earlier cycles). As a result, industry analysts are now debating whether the upgrade cycle has been lengthened, or whether it has disappeared altogether. Timing of the next upgrade cycle may depend largely on the emergence of a new killer app that would drive demand.

## THE "WHITE BOX" MARKET

Computer hardware vendors are often classified into various tiers, reflecting their global scale and brands. The largest vendors are IBM (though its PC business is now owned by Lenovo), Sun Microsystems, HP, and Dell and are known as "Tier 1" vendors. Smaller companies with still recognizable brands, such as Gateway (now part of Acer), Acer, or Toshiba Corp., are often described as second-tier vendors.

Below the second tier lies an enormous but highly fragmented group of companies selling unbranded "white box" computers that they have either assembled themselves or purchased from a local assembler. White boxes increasingly use the same components as branded computers, therefore, their functionality differs little from those sold by branded OEMs. Globally, white box sales account for a significant share of the PC market. Small and medium-sized businesses are the primary purchasers of white boxes, in part because they value low prices, local service, custom configurations, and value-added offerings such as network design and installation.

There is also a small but developing niche market for high-performance PCs that are optimized for video game applications. Several companies now make PCs targeted to hard-core video game enthusiasts that feature additional memory, top quality graphics, and faster processing speeds. These PCs command a substantial price premium compared with more standardized models. Indicative of this trend, in our opinion, was Dell's acquisition of Alienware Corp. in May 2006, which solidified its presence in the gaming market. Importantly, Alienware is being operated as a separate entity (a wholly owned subsidiary) within Dell.

The price gap between top-tier vendors' machines and those manufactured by second-tier vendors has narrowed. Consequently, differentiation has focused on other values, including product performance, quality, and reliability; service and support; marketing and distribution capability; and, corporate reputation.

The quality of a company's service and support, and the range of products and options it makes available, have grown in importance. Top-tier vendors offer extensive in-house support, while support from second-tier vendors is usually adequate, but not as deep. White box vendors offer some localized support, but it is very limited in scale.

## **SEASONAL SALES CAN MAKE OR BREAK THE YEAR**

Computer hardware manufacturers face a variety of seasonal influences on their sales. These factors include differences in customs and business practices in other parts of the world, the retail cycle for home PCs, and the year-end sales push for corporate hardware.

For large-system vendors, the fourth quarter is traditionally the most significant revenue and earnings period. This is due to a number of factors. First, because most businesses close their books in December, managers often seek to deplete their capital spending budgets for fear of funding cutbacks the following year. Second, vendors often put significant financial incentives in place to spur the industry's legions of sales representatives to meet year-end sales goals. The fear of forfeiting large cash bonuses usually results in a sales surge during the fourth quarter.

With PC shipments to consumers accounting for a number approaching half of the worldwide total, the consumer market also plays a role in the seasonality of the hardware industry. PC manufacturers now focus on gearing up for the back-to-school selling season and the later push for holiday purchases. Most PC vendors make substantial advertising and marketing outlays during the third and fourth quarters to capitalize on these important seasons.

In addition, many US-based computer hardware vendors derive more than 40% of their revenues from international markets. This has a significant seasonal impact on PC sales as well. For example, European businesses typically experience a summer slowdown in business activity. Most vendors have adjusted their business models and expectations to reflect the longer sales cycles and uneven demand patterns during the summer period in Europe.

## **KEY INDUSTRY RATIOS AND STATISTICS**

◆ **Business capital spending.** Despite the increased importance of the consumer in the computer hardware market, large corporations and small office/home office (SOHO) businesses are the primary drivers of spending on information technology (IT). Corporate spending represents about 80% of all technology spending, and economic conditions that depress business capital spending have significant negative consequences for computer hardware sales.

After peaking in 2000, IT spending fell 3.4% in 2002, rose around 3.0% in 2003, and has increased at a mid single-digit rate in each of the past five years, according to IDC, a market research firm. As of February 2010, IDC estimated worldwide IT spending for 2009 fell 4.5% in constant currency terms, marking a downshift from the pace in recent years, but also expected a 3% increase in 2010 as the industry tries to get back on track. For its part, market researcher Gartner similarly scored a 4.6% decrease in global IT spending in 2009, and forecast a rebound in 2010 at a 4.6% rate, as of January 2010, reflecting an industry comeback and exchange rate fluctuations.

◆ **Consumer confidence.** Consumer spending accounts for only about 10% of total IT spending directly, but it is also an important factor for the computer industry on an indirect basis. First, consumer confidence is an important element in corporate profitability, which in turn drives business capital spending. In addition, as PC penetration in the home increases, businesses must invest more in their IT infrastructure to handle increasing demand for e-commerce transactions and other high-tech services.

A high level of consumer confidence generally signals that people feel good about the economy, their job prospects, and their future earnings ability. When confidence is high or rising, it is usually accompanied by increased spending and borrowing—necessary ingredients for the purchase of a relatively big-ticket item like a PC. Conversely, when consumer confidence is dropping, people are more likely to postpone nonessential outlays.

The Conference Board conducts the most widely followed consumer confidence survey. It polls 5,000 representative households each month to gauge consumer sentiment. This measure of consumer attitudes is expressed as an index, with 1985 as a base year (1985=100). This index dipped to 46.0% in February 2010, down from 56.5% in January. Following several months of upticks in consumer confidence, anxieties about earnings and job security seemed to reappear in February, the Conference Board noted.

◆ **Real growth in gross domestic product (GDP)/IT's share of GDP.** GDP, the broadest measure of aggregate economic activity, is the market value of all goods and services produced by labor and capital in the United States and is reported quarterly by the US Department of Commerce. Growth in the economy is measured by changes in inflation-adjusted (or real) GDP. Real GDP grew just 0.4% in 2008, and then contracted 2.4% in 2009. As of March 2010, Standard & Poor's economists were projecting real GDP growth of 2.8% in 2010 and a further 2.9% in 2011.

In recent years, spending in the US on IT goods and services (as tracked and defined by market research firm Forrester Research Inc.) ranged from \$487 billion in 2005, up to \$580 billion in 2008, before dipping to an estimated \$533 billion for 2009; Forrester forecasts a rise to \$568 billion for 2010. Comparing these amounts to US GDP figures (from the US Department of Commerce and estimates from Standard & Poor's), we find IT spending typically representing about 4% of US GDP between 2005 and 2010, with a peak near 4.1% of US GDP in 2008 and a bottom of 3.7% in 2009. This suggests to us that IT spending is cyclical, gaining steam in a strong year for the economy like 2008, and shrinking relatively in a bust year such as 2009.

On a related point, US IT spending represents a little more than a third of global IT spending. Again by Forrester's figures, the US represented about 38% of global IT spending in 2005, though that share has tended to shrink in recent years, with Forrester estimating the US share at about 35% for 2010. This would indicate faster IT spending growth outside the US, which would square with a view that emerging market regions are employing more computer equipment, communications equipment, software, IT consulting and systems integration services, and IT outsourcing (the categories followed by Forrester) as they seek growth. The computer equipment category represented about 26% of global IT spending of \$1.28 trillion in 2005, easing to about 24% of \$1.63 trillion in 2010, as estimated by Forrester.

◆ **Currency exchange rates.** The multinational nature of the computer hardware industry means that the value of the dollar, compared with that of other currencies, is of great importance. Companies like International Business Machines Corp. (IBM), Dell Inc., and Hewlett-Packard Co. generate a significant proportion of their sales and profits from outside the United States and thus are affected by changes in the dollar's value versus other currencies. For example, revenues transferred from IBM's Japanese subsidiary to the US-based parent are hurt when the dollar strengthens against the yen. Conversely, those revenues will increase when the dollar weakens compared with the yen.

For US computer hardware companies that have a significant operating presence in international markets, currency swings also affect the expense side of their ledgers. The increasing level of global exposure often causes wide variations in these companies' reported results.

To limit the financial risk associated with currency swings, companies are increasing their use of hedging techniques. This has helped them to limit foreign currency impacts on financial results. Still, it is important to understand both the net impact of currency swings on reported financial statements and the true level of business activity on a constant currency basis.

## **HOW TO ANALYZE A COMPUTER HARDWARE COMPANY**

Rapid technological changes make it imperative for analysts and investors to go beyond traditional quantitative methods in assessing a computer hardware company's outlook. To be sure, financial statement analysis is a critical ingredient in determining the future prospects of any company. However, qualitative judgments must also be made about technology, competition, business and marketing strategies, and the credibility and potential of a company's management team, as well as prospects for the industry as a whole.

Analysis of the quantitative and qualitative aspects of a computer hardware company should be considered within the context of the omnipresent threats and opportunities posed by new technology. Again, rapid changes are key characteristics of the industry, and how well a company manages this variable can determine whether it emerges as an industry leader, becomes a second- or third-tier player, or fails to make the grade.

The history of the computer industry contains vivid examples of companies with dominant franchises that failed to keep up with technological shifts away from their core markets. Apple Inc. (formerly Apple Computer Inc.), Digital Equipment Corp. (DEC), and International Business Machines Corp. (IBM) all dominated key segments of the computer hardware industry, only to see their financial positions deteriorate as the market shifted toward faster, cheaper, and more functional products. Their declining positions eventually showed up on the companies' financial statements, but an individual attuned to industry dynamics would have been alerted by earlier clues.

We note that Apple and IBM, with the benefit of keen management and a renewed focus on core competencies to differentiate themselves from their peers, have improved their financials markedly over the past decade. Compaq Computer Corp. acquired DEC in 1998; Hewlett-Packard Co. in turn acquired Compaq in May 2002.

More recently, as networked computing has become ubiquitous, layers of complexity have been added to computing environments. Increasingly, customers rely on their hardware vendors to provide consulting and support services. Therefore, in assessing the competitive stance of a hardware vendor, an analyst should evaluate the company's services capabilities and its strategy for the future in this area.

### **COMPARATIVE ANALYSIS IS CRITICAL**

An analyst must identify a company's competitive advantages—and its disadvantages. What are the company's key products and markets, and how does it differentiate itself from its peers? How does its current strategy compare with its plans for the future, and how do they both compare with the strategies of competitors? Has management been able to articulate strategy, and does its past performance indicate it will be successful in executing its plans? Does the company have an edge over its competitors? If so, is it likely to maintain that edge?

In most industries, product differentiation is one strategy companies use to achieve a competitive advantage over peers; in the personal computer (PC) industry, however, it has meant relatively little. Most PCs are based on an Intel Corp. microprocessor and Microsoft Corp. software, so there is little in the way of product differentiation. For laptops, weight and battery life are design factors that can create some differentiation. Broadly speaking, however, PCs are viewed as commodity-like because of a lack of product differentiation, so price becomes the key differentiator. Quality, reliability, and the level of service and support also play key roles, partly because these factors affect the total cost of ownership of a computer.

Ultimately, market forces will determine the relative importance of considerations other than price. An analyst needs to understand how each company has positioned itself concerning these factors and whether the strategy makes sense, given the trend seen for overall market demand.

### **Growth is relative**

How does a company's financial performance compare with others in its peer group? Again, while absolute numbers are an important part of the financial assessment of any company, comparing performance and financial ratios with those of its peers is critical. For example, it is clearly a cause for concern if a company

achieved revenue growth of 5% in a year in which the average industry growth rate was 10%. Why did the company underperform? Similarly, if a company's growth outpaces the average, analysts will want to uncover the reasons. Is that above-average growth rate sustainable?

The next step is to consider the growth rate for the particular industry segments in which the company participates. The outlook for mainframe computers, for example, differs from the higher growth prospects for PCs and servers.

Finally, the financial results of a company should always be considered within the context of the markets it serves. Does the company primarily serve the consumer or corporate market for PCs? In which geographic areas does it participate? What is the company's growth relative to its competition in these geographic areas and the market's overall growth potential? A company's geographic footprint can affect its effective tax rate, as well as revenue potential and production cost levels; tax rates typically head lower as more operations occur outside the United States.

## QUANTITATIVE ANALYSIS: LOOKING AT FINANCIAL STATEMENTS

Analyzing a company's principal financial documents—the income statement and the balance sheet—provides an important base for assessing its overall performance.

### Key elements on the income statement

A company's income statement shows its operating results over a specific period and thus is a key part of any analytical endeavor. An analyst should determine the components and trends of a company's profits, then compare these results with those of its competitors.

◆ **Sales trends.** Beginning at the top of the income statement, analysts should look at short-term and long-term growth trends in revenues. Ideally, sales in the current period should show growth from the year-earlier period. Moreover, if the company participates in a high-growth industry, or if it is in the early stage of a new product cycle, sequential growth (from one quarter to the next) would be expected, although seasonal factors should also be considered. Again, sales growth should be compared with that of direct competitors and against the overall industry rate.

◆ **Gross profit margin.** This is arguably one of the most important profitability measures to consider in assessing a computer hardware company. Gross margins (the percentage of sales remaining after subtracting the cost of goods sold or costs such as materials, labor, and overhead) can be affected by a number of variables, including sales mix, sales volumes, pricing pressures, and component costs.

Significant gross margin pressure has been the norm in the computer hardware industry in recent years, as pricing competition has intensified. Successful companies have been able to counter margin pressure somewhat by adding a higher-margin mix of products, improving their manufacturing efficiency, and maintaining lean inventory levels.

Gross margins differ greatly among hardware platforms. For large-system manufacturers, gross margins typically range from 40% to 50%, while PC vendors typically have gross margins between 10% and 25%. This divergence reflects the large gap in the average selling price between these two segments.

Recently, vendors of high-end systems have emphasized their service offerings. This has put pressure on margins, since services typically carry lower gross margins than large system sales. PC vendors, meanwhile, have recently buoyed gross margins by emphasizing sales of non-PC items, such as software, and by using contract manufacturers (see the "How the Industry Operates" section of this *Survey*).

◆ **Expense line items.** These include selling, general, and administrative (SG&A) costs and research and development (R&D) costs, which should be evaluated relative to industry norms. Ideally, expenses should increase at a slower rate than sales. However, technology companies with high growth prospects sometimes must expand their workforce rapidly to support sales growth and/or new product development. Consequently, their expenses can rise faster than sales in these years.

Because R&D is critical to sustaining a competitive advantage in the computer hardware industry (though less so in the PC segment), healthy growth rates in this area can be viewed positively. However, one should make sure these investments are paying off in the form of higher sales and market share gains for the company, to determine that the company is making the right choices in its R&D spending.

◆ **Operating margins.** How successful is the company at making a profit on its sales dollar? Operating margins (operating profits divided by net sales) in the computer hardware industry have been volatile over the past several years, largely reflecting the degradation of gross margins. Still, companies adept at limiting expense growth to match that of sales growth can preserve operating margins.

◆ **Net profit margin.** This is the bottom line and is calculated as net income divided by total sales. Along with operating performance, it reflects a company's taxes and its nonoperating income and expense items, such as interest income and interest expense. As many companies have reduced debt levels and have improved operating efficiencies, net profit margins have begun to improve in recent periods.

### **Balance sheet provides clues to future results**

How strong is a company's financial position? The balance sheet offers a snapshot of the company's financial position at a specific moment in time. Some factors to study include the ratio of long-term debt to capital, current assets, the current ratio, inventories, and accounts receivable.

◆ **The ratio of long-term debt to capital.** Long-term debt as a percentage of total capital varies widely among computer makers, but most established companies target a ratio of 30% or less. In recent years, many PC makers, including Dell Inc., have been well below this level, although Dell began to stretch the top end of this range as it acquired Perot Systems in 2009. Low debt levels give a company the financial flexibility to acquire emerging technologies or other technology companies. A low debt level also minimizes interest expense.

◆ **Current assets.** Also important in the analysis of a technology company is a careful examination of current assets. Is the company headed for a potential cash crunch? The level of cash and marketable securities is usually a good starting point for assessing a company's short-term liquidity. Because the computer hardware industry is subject to wide swings in profitability, most companies require a reasonable level of cash and cash equivalents for emergency liquidity and growth needs. The proper level will vary from company to company, but a good rule of thumb is for cash to equal 10% of total assets.

◆ **The current ratio.** Another check on liquidity is the current ratio (the ratio of current assets to current liabilities), also called the working capital ratio. A healthy working capital ratio helps to ensure that the company can adequately meet its current liabilities; this ratio should be greater than one. Any meaningful degradation in the current ratio from previous reporting periods should be closely examined.

◆ **Inventories.** Given the computer hardware industry's tendencies toward rapid price declines and inventory obsolescence, the level and health of a company's inventory position must be constantly monitored. When inventory levels increase faster than the rate of sales growth, it can signal either potential opportunity or potential trouble. For example, it may be that the company is gearing up for heightened business activity, such as in the early stages of a new product cycle. Alternatively, it could be a red flag signaling that existing products are not selling well.

How fast is the company turning over its inventory? This is a critical question companies are increasingly asking themselves on two levels: as a clue to manufacturing efficiency and as a cash-management optimization tool. Product sitting on a shelf in a warehouse ties up assets that could be better deployed—put toward investments in future growth, for instance. A key measure to watch is the inventory turnover ratio (the annualized cost of goods sold divided by the value of average inventory), which measures the average speed at which inventories move to sales. Any meaningful change in inventories or turnover rates should be investigated.

◆ **Accounts receivable.** An analysis of accounts receivable can provide insight into how well a company's products are selling. A rise in the level of accounts receivable may indicate that a significant portion of sales



was made in the last few weeks of the quarter. Although many technology companies experience this type of sales trend (sometimes described as a “hockey stick”), it could signal that price concessions or generous payment terms had to be extended to pump up sales. However, as the computer hardware industry becomes more global, accounts receivable could generally trend higher as a matter of logistics. One way to track accounts receivable is by measuring the days’ sales outstanding (DSOs). Simply divide accounts receivable by sales for a given quarter and multiply by 91.

### **Performance and valuation metrics to consider**

Drawing from both the income statement and the balance sheet, two important measures of a company’s overall financial performance are return on assets and return on equity. These measures, along with growth projections, provide key indicators for a valuation analysis.

In evaluating the relative attractiveness of a company’s current stock price, performance metrics and growth rates should be considered alongside price-related valuation ratios such as price/earnings, price/sales, and price/cash flow. The analyst should compare valuation ratios with the company’s own historical ratios and with those of peer companies and the overall stock market.

◆ **ROA and ROE.** Any financial statement analysis would be incomplete without some discussion of return on investment, of which the two most popular measures are return on assets (ROA) and return on equity (ROE). ROA (net income divided by average total assets) measures the operating efficiency of a firm or the return earned on assets under management’s discretion. ROE (net income divided by average total shareholders’ equity) measures the return earned on shareholders’ capital. Both ratios measure management’s ability to earn a reasonable profit on the assets and capital entrusted to them.

IBM struggled with these metrics in the early 1990s as customers transitioned away from the old-style mainframe platform to the more popular PC, and the company posted losses through 1993. Since that time, newer IBM products and a strategy that emphasized higher growth opportunities in software and services have generated steady improvement in the company’s ROA and ROE measures. From \$2.5 billion in 1994, IBM’s earnings increased to nearly \$13.4 billion in 2009, while its ROA improved from 3.7% to 12.3%. Its ROE expanded from 14.3% to 74.4% during the same period.

◆ **P/E and PEG.** The term P/E refers to the price-to-earnings ratio of a stock. To arrive at this figure, simply take the stock price and divide by the current year’s projected earnings. For a forward projection, one can use the forecasted earnings for the next year. A variation of this ratio, which can be used to weigh the strength of earnings growth as part of valuation assessments for a given company relative to its peers, is referred to as the PEG ratio, or the P/E divided by the company’s projected average five-year earnings growth rate.

◆ **Price/sales.** Dividing the current share price of the company by its projected revenues for the current year on a per-share basis is how price/sales ratio is derived. This ratio is used in times when earnings are not available (the company is operating at a loss), or when earnings forecasts are in question.

◆ **Price/cash flow.** This ratio is calculated by taking the price of a company’s stock and dividing by the sum of the current year’s forecasted cash flow. The most commonly used proxy for a company’s cash flow is referred to as EBITDA (earnings before interest, taxes, and depreciation and amortization). The real-world use of this ratio is generally derived using the forecast of EBITDA for the next year. This ratio is typically applied in cases where a company’s earnings are penalized by high capital intensity. ■

# INDUSTRY REFERENCES

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## PERIODICALS

### ***Computerworld***

<http://www.computerworld.com>

Weekly; computer hardware and software news.

### ***CRN***

<http://www.crn.com>

Weekly; computer hardware and software industry news.

### ***Electronic News***

<http://www.electronicnews.com>

Weekly; news coverage of the semiconductor, computer hardware, and computer software industries.

### ***Information Week***

<http://www.informationweek.com>

Weekly; news and features on the computer hardware and software industries.

### ***InfoWorld***

<http://www.infoworld.com>

Weekly; covers computer hardware and software.

### ***PC Magazine***

<http://www.pcmag.com>

Bimonthly; covers news in the personal computer industry.

## MARKET RESEARCH COMPANIES

### **Datamonitor America**

<http://www.datamonitor.com>

Basic market research covering computer hardware and other industries.

### **Forrester Research Inc.**

<http://www.forrester.com>

Leading market research firm with expertise in technology; also gives advice about technology's impact on business.

### **Gartner Inc.**

<http://www.gartner.com>

Provides worldwide market coverage on various sectors of the information technology industry, including semiconductors, computer systems and peripherals, communications, document management, software, and services.

### **IDC**

<http://www.idc.com>

Leading provider of information technology data, analysis, and consulting.

## ONLINE RESOURCES

CNET News.com: <http://www.news.com>

Daily news coverage, product reviews, and software downloads.

### **Company websites:**

Acer Inc.: <http://www.acer.com>

Apple Inc.: <http://www.apple.com>

Dell Inc.: <http://www.dell.com>

Hewlett-Packard Co.: <http://www.hp.com>

International Business Machines Corp.:  
<http://www.ibm.com>

Lenovo Group Ltd.: [www.lenovo.com](http://www.lenovo.com)

Oracle Corp.: <http://www.oracle.com>

Palm Inc.: <http://www.palm.com>

Toshiba Corp.: <http://www.toshiba.com>

## COMPARATIVE COMPANY ANALYSIS — COMPUTERS: HARDWARE

### Operating Revenues

Ticker	Company	Yr. End	Million \$							CAGR (%)			Index Basis (1999 = 100)				
			2009	2008	2007	2006	2005	2004	1999	10-Yr.	5-Yr.	1-Yr.	2009	2008	2007	2006	2005
COMPUTER HARDWARE‡																	
AAPL	□ APPLE INC	SEP	42,905.0	32,479.0	24,006.0	19,315.0	13,931.0	8,279.0	6,134.0	21.5	39.0	32.1	699	529	391	315	227
AVID	§ AVID TECHNOLOGY INC	DEC	629.0	844.9	929.6	910.6 A	775.4 A	589.6 A	452.6	3.3	1.3	(25.6)	139	187	205	201	171
DELL	□ DELL INC	# JAN	52,902.0 A	61,101.0	61,133.0	57,420.0	55,908.0	49,205.0	25,265.0	7.7	1.5	(13.4)	209	242	242	227	221
DBD	† DIEBOLD INC	DEC	2,718.3 D	3,170.1 A,C	2,964.8 A	2,906.2 A	2,587.0 A,C	2,380.9 A	1,259.2	8.0	2.7	(14.3)	216	252	235	231	205
HPQ	□ HEWLETT-PACKARD CO	OCT	114,552.0	118,364.0 A	104,286.0	91,658.0	86,696.0	79,905.0	42,370.0 D	10.5	7.5	(3.2)	270	279	246	216	205
IBM	□ INTL BUSINESS MACHINES CORP	DEC	95,758.0 A	103,630.0 A	98,786.0 A	91,424.0 A	91,134.0 A,C	96,293.0 A	87,548.0	0.9	(0.1)	(7.6)	109	118	113	104	104
NCR	† NCR CORP	DEC	4,612.0	5,315.0	4,970.0 D	6,142.0	6,028.0	5,984.0	6,196.0	(2.9)	(5.1)	(13.2)	74	86	80	99	97
SSYS	§ STRATASYS INC	DEC	98.4	124.5	112.2	103.8	82.8	70.3	37.6	10.1	6.9	(21.0)	262	331	299	276	220
TDC	□ TERADATA CORP	DEC	1,709.0	1,762.0	1,702.0	1,560.0	1,467.0	NA	NA	NA	NA	(3.0)	**	**	**	**	NA

Note: Data as originally reported. CAGR-Compound annual growth rate. ‡S&P 1500 index group. □Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.

\*\*Not calculated; data for base year or end year not available. A - This year's data reflect an acquisition or merger. B - This year's data reflect a major merger resulting in the formation of a new company. C - This year's data reflect an accounting change.

D - Data exclude discontinued operations. E - Includes excise taxes. F - Includes other (nonoperating) income. G - Includes sale of leased depts. H - Some or all data are not available, due to a fiscal year change.

## Net Income

Ticker	Company	Yr. End	Million \$							CAGR (%)			Index Basis (1999 = 100)				
			2009	2008	2007	2006	2005	2004	1999	10-Yr.	5-Yr.	1-Yr.	2009	2008	2007	2006	2005
COMPUTER HARDWARE‡																	
AAPL	□ APPLE INC	SEP	8,235.0	4,834.0	3,496.0	1,989.0	1,335.0	276.0	601.0	29.9	97.2	70.4	1,370	804	582	331	222
AVID	§ AVID TECHNOLOGY INC	DEC	(68.4)	(198.2)	(8.0)	(42.9)	34.0	71.7	(137.5)	NM	NM	NM	NM	NM	NM	NM	NM
DELL	□ DELL INC	# JAN	1,433.0	2,478.0	2,947.0	2,583.0	3,572.0	3,043.0	1,666.0	(1.5)	(14.0)	(42.2)	86	149	177	155	214
DBD	† DIEBOLD INC	DEC	73.1	101.5	39.5	86.5	82.9	183.8	128.9	(5.5)	(16.8)	(28.0)	57	79	31	67	64
HPQ	□ HEWLETT-PACKARD CO	OCT	7,660.0	8,329.0	7,264.0	6,198.0	2,398.0	3,497.0	3,104.0	9.5	17.0	(8.0)	247	268	234	200	77
IBM	□ INTL BUSINESS MACHINES CORP	DEC	13,425.0	12,334.0	10,418.0	9,416.0	7,994.0	8,448.0	7,712.0	5.7	9.7	8.8	174	160	135	122	104
NCR	† NCR CORP	DEC	(33.0)	231.0	171.0	382.0	529.0	290.0	337.0	NM	NM	NM	(10)	69	51	113	157
SSYS	§ STRATASYS INC	DEC	4.1	13.6	14.3	11.2	10.6	9.1	2.1	6.7	(14.7)	(69.8)	192	635	668	521	495
TDC	□ TERADATA CORP	DEC	254.0	250.0	200.0	198.0	206.0	NA	NA	NA	NA	1.6	**	**	**	**	NA

Note: Data as originally reported. CAGR-Compound annual growth rate. ‡S&P 1500 index group. □Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600.

#Of the following calendar year. \*\*Not calculated; data for base year or end year not available.

Ticker	Company	Yr. End	Return on Revenues (%)					Return on Assets (%)					Return on Equity (%)				
			2009	2008	2007	2006	2005	2009	2008	2007	2006	2005	2009	2008	2007	2006	2005
COMPUTER HARDWARE‡																	
AAPL	□ APPLE INC	SEP	19.2	14.9	14.6	10.3	9.6	18.9	14.9	16.4	13.8	13.6	31.3	27.2	28.5	22.8	21.3
AVID	§ AVID TECHNOLOGY INC	DEC	NM	NM	NM	NM	4.4	NM	NM	NM	NM	4.1	NM	NM	NM	NM	5.4
DELL	□ DELL INC	# JAN	2.7	4.1	4.8	4.5	6.4	4.8	9.2	11.1	10.6	15.4	28.9	61.9	73.1	61.1	67.3
DBD	† DIEBOLD INC	DEC	2.7	3.2	1.3	3.0	3.2	2.9	3.9	1.5	3.6	3.7	7.3	9.9	3.6	7.7	6.9
HPQ	□ HEWLETT-PACKARD CO	OCT	6.7	7.0	7.0	6.8	2.8	6.7	8.2	8.5	7.8	3.1	19.3	21.5	18.9	16.5	6.4
IBM	□ INTL BUSINESS MACHINES CORP	DEC	14.0	11.9	10.5	10.3	8.8	12.3	10.7	9.3	9.0	7.4	74.4	58.8	36.6	30.6	25.4
NCR	† NCR CORP	DEC	NM	4.3	3.4	6.2	8.8	NM	5.1	3.4	7.3	9.8	NM	21.0	9.4	19.5	25.7
SSYS	§ STRATASYS INC	DEC	4.2	10.9	12.8	10.8	12.8	2.7	9.2	10.7	10.0	10.4	3.3	11.1	12.9	12.1	12.4
TDC	□ TERADATA CORP	DEC	14.9	14.2	11.8	12.7	14.0	16.9	18.4	17.4	20.6	NA	30.1	35.5	32.6	35.5	NA

Note: Data as originally reported. ‡S&P 1500 index group. □Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.

			Current Ratio					Debt / Capital Ratio (%)					Debt as a % of Net Working Capital				
Ticker	Company	Yr. End	2009	2008	2007	2006	2005	2009	2008	2007	2006	2005	2009	2008	2007	2006	2005
COMPUTER HARDWARE‡																	
AAPL	□ APPLE INC	SEP	2.7	2.5	2.4	2.2	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AVID	§ AVID TECHNOLOGY INC	DEC	1.9	2.0	2.5	2.5	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DELL	□ DELL INC	# JAN	1.3	1.4	1.1	1.1	1.1	37.7	30.8	8.6	11.3	11.9	64.7	35.9	26.7	26.5	31.4
DBD	† DIEBOLD INC	DEC	2.1	2.2	2.2	2.7	2.5	33.1	37.8	34.7	37.1	27.7	65.3	69.0	70.6	67.9	55.2
HPQ	□ HEWLETT-PACKARD CO	OCT	1.2	1.0	1.2	1.3	1.4	23.8	15.4	11.4	6.1	8.4	146.6	NM	61.4	20.1	28.6
IBM	□ INTL BUSINESS MACHINES CORP	DEC	1.4	1.2	1.2	1.1	1.3	48.6	62.1	43.8	32.1	30.8	169.6	345.4	259.8	301.6	146.8
NCR	† NCR CORP	DEC	1.7	1.5	2.0	1.9	1.6	1.8	1.5	14.4	13.7	12.9	1.2	0.8	19.7	19.6	29.1
SSYS	§ STRATASYS INC	DEC	4.5	3.5	3.6	3.7	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TDC	□ TERADATA CORP	DEC	2.1	1.9	1.5	1.3	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Data as originally reported. ‡S&P 1500 index group. □Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.

Ticker	Company	Yr. End	Price / Earnings Ratio (High-Low)					Dividend Payout Ratio (%)					Dividend Yield (High-Low, %)				
			2009	2008	2007	2006	2005	2009	2008	2007	2006	2005	2009	2008	2007	2006	2005
COMPUTER HARDWARE‡																	
AAPL	□ APPLE INC	SEP	23 - 8	37 - 14	50 - 20	39 - 21	46 - 19	0	0	0	0	0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
AVID	§ AVID TECHNOLOGY INC	DEC	NM - NM	NM - NM	NM - NM	NM - NM	76 - 40	NM	NM	NM	NM	0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
DELL	□ DELL INC	# JAN	24 - 11	21 - 7	23 - 16	28 - 16	28 - 19	0	0	0	0	0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
DBD	† DIEBOLD INC	DEC	30 - 17	26 - 15	91 - 47	36 - 28	49 - 28	95	65	157	66	70	5.5 - 3.1	4.4 - 2.5	3.3 - 1.7	2.4 - 1.8	2.5 - 1.4
HPQ	□ HEWLETT-PACKARD CO	OCT	16 - 8	15 - 8	19 - 14	19 - 13	36 - 23	10	10	12	14	39	1.3 - 0.6	1.1 - 0.6	0.8 - 0.6	1.1 - 0.8	1.7 - 1.1
IBM	□ INTL BUSINESS MACHINES CORP	DEC	13 - 8	14 - 8	17 - 12	16 - 12	20 - 14	21	21	20	18	16	2.6 - 1.6	2.7 - 1.5	1.7 - 1.2	1.5 - 1.1	1.1 - 0.8
NCR	† NCR CORP	DEC	NM - NM	20 - 9	61 - 24	21 - 15	14 - 10	NM	0	0	0	0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
SSYS	§ STRATASYS INC	DEC	96 - 38	43 - 13	46 - 22	31 - 20	37 - 20	0	0	0	0	0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
TDC	□ TERADATA CORP	DEC	22 - 9	20 - 8	27 - 20	NA - NA	NA - NA	0	0	0	NA	NA	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	NA - NA	NA - NA

Note: Data as originally reported. ‡S&P 1500 index group. □Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.

Ticker	Company	Yr. End	Earnings per Share (\$)					Tangible Book Value per Share (\$)					Share Price (High-Low, \$)									
			2009	2008	2007	2006	2005	2009	2008	2007	2006	2005	2009		2008		2007		2006		2005	
COMPUTER HARDWARE‡																						
AAPL	□ APPLE INC	SEP	9.22	5.48	4.04	2.36	1.65	34.66	23.12	16.27	11.47	8.83	213.95 -	78.20	200.26 -	79.14	202.96 -	81.90	93.16 -	50.16	75.46 -	31.30
AVID	§ AVID TECHNOLOGY INC	DEC	(1.83)	(5.28)	(0.19)	(1.03)	0.90	4.99	6.17	8.46	7.74	7.70	15.48 -	8.40	29.91 -	9.68	38.78 -	24.79	59.10 -	32.05	68.35 -	35.78
DELL	□ DELL INC	# JAN	0.73	1.25	1.33	1.15	1.49	(0.06)	0.93	0.63	1.94	1.77	17.26 -	7.84	26.04 -	8.72	30.77 -	21.61	32.24 -	18.95	42.30 -	28.62
DBD	† DIEBOLD INC	DEC	1.10	1.54	0.60	1.30	1.17	8.98	8.14	9.84	9.62	11.11	33.18 -	18.80	40.45 -	22.50	54.50 -	28.32	47.13 -	36.40	57.81 -	33.10
HPQ	□ HEWLETT-PACKARD CO	OCT	3.21	3.35	2.76	2.23	0.83	0.34	(0.56)	4.91	6.57	6.04	52.95 -	25.39	50.98 -	28.23	53.48 -	38.15	41.70 -	28.37	30.25 -	18.89
IBM	□ INTL BUSINESS MACHINES CORP	DEC	10.12	9.07	7.32	6.15	4.99	0.65	(4.94)	9.51	9.61	14.61	132.85 -	81.76	130.93 -	69.50	121.46 -	88.77	97.88 -	72.73	99.10 -	71.85
NCR	† NCR CORP	DEC	(0.21)	1.40	0.95	2.12	2.86	2.77	2.16	9.39	9.43	10.26	15.23 -	6.62	28.09 -	12.23	57.50 -	22.56	44.74 -	31.64	39.84 -	29.09
SSYS	§ STRATASYS INC	DEC	0.20	0.66	0.69	0.55	0.50	6.36 J	5.85	5.68	4.70	4.05	19.15 -	7.58	28.20 -	8.77	31.45 -	15.40	17.19 -	11.02	18.75 -	9.86
TDC	□ TERADATA CORP	DEC	1.48	1.40	1.11	1.10	1.15	4.75	3.76	2.91	NA	NA	32.24 -	12.75	27.90 -	11.11	30.08 -	22.35	NA -	NA	NA -	NA

Note: Data as originally reported. ‡S&P 1500 index group. □Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.  
J-This amount includes intangibles that cannot be identified.

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